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Training Teaching Assistants in Inquiry-Based Learning

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Inquiry-based laboratory exercises are usually a new learning experience for undergraduate students. We may also overlook that inquiry-based learning could be a new experience for many of our Graduate Teaching Assistants. The NMSU Biology Department runs a two to three day Graduate TA Orientation each August which begins by introducing the TAs to inquiry-based learning. We discuss the philosophy and objectives of this teaching method and the TAs experience an inquiry-based activity for themselves. The purpose of this activity is to allow the TAs to gain some insight into what their students will encounter in the laboratory course. Participants in this mini workshop will learn about the topics covered in our TA Orientation program. The primary focus of the mini workshop will be conducting the activities we use to train TAs in inquiry-based learning.

Keywords: TA training, inquiry-based learning

Introduction

The majority of laboratory exercises in the introductory biology lab courses at New Mexico State University are inquiry-based exercises (IBL). I believe IBL is the most effective method for teaching students the process of science. However, the success of IBL in the classroom may be limited by the manner in which the lab exercises are presented to the students. Obtaining the cooperation of Teaching Assistants to implement IBL is critical, but can be challenging if the TA has not encountered IBL in the classroom during their own academic career. A study of chemistry teaching assistants found that whether a TA had ever experienced IBL as a student greatly influenced their instructional decisions in an IBL lab exercise (Roehrig, *et al.* 2003). In addition, the TAs did not have the instructional skills needed in an inquiry-based environment and had ill-formed conceptions about how students learn (Roehrig, *et al.,* 2003).

Training TAs with respect to the philosophy and pedagogy of IBL is one step in providing them with the necessary skills and securing their commitment to teaching by this method. In addition, I find it valuable to give TAs the experience of IBL from a student's perspective. The following activity is taken from a Buffalo Case Study. I use this activity during our annual Biology TA Orientation program, a two-day series of meetings and workshops held each August. During the activity, small groups of TAs work through the scientific process of developing a hypothesis and designing an experimental method to investigate the contents of a box. Follow-up discussions address the TAs' reactions to the activity and lead into training on the purpose and methods of inquiry-based learning.

Procedure

1. Each team of 3-4 Teaching Assistants receives a Box and the "Thinking Inside the Box" instructions listed (Table1).
2. Teams are given 15-20 minutes to develop a description of the contents of the box (aka *hypothesis development*). The goal is not to identify the objects in the box, simply to describe their characteristics

Table 1. Thinking inside the box.

Dear Fellow *Box* Researcher: It is my pleasure to invite you, and the members of your research team, to attend the First Annual "Thinking Inside *The Box*" Conference. We would like you to present the results of your investigative studies on the contents of *The Box*. A reminder of the ground rules for these studies: 1. Investigators must, to the best of their ability, describe the contents of the box. 2. The Box may never be opened; the contents may not be viewed. We look forward to your presentation at this conference. Sincerely, Conference Chair

3. One member of each team gives a report to the conference on their description of the contents of their *Box*.
4. The FBI (the Federal Box Institute) is accepting grant proposals to further *The Box* studies and would like to receive a proposal from each team regarding how they would determine the contents of The Box. Conference rules apply: you still can't open *The Box*.
5. Teams are given 10-15 minutes to develop their research proposal. (aka *experimental design*)
6. One member of each team gives a report to the FBI detailing the experimental method and predicted results for the contents of *The Box*.
7. FBI Agency Review: All members of the conference act as the review panel. Each conference member votes for their favorite proposal (no, you can't vote for your own proposal). The proposal with the greatest number of votes will be funded.

Notes for the Instructor

The boxes should be small, 4 – 6 inches on each side, and sealed tightly with duct tape. You can populate the boxes with any common items but should strive to have items with very different characteristics. I've used pennies, crayons, metallic objects (e.g., washers, screws, paper clips), plastic objects (e.g., pipette tips), objects that will roll inside the box (wooden balls), and objects that will not roll. Boxes should contain 3 – 5 different items but can contain multiples of any particular item. Each box can contain the same items or every box can be different. **I recommend that you never reveal the contents of the box even after the activity is completed.** If you divulge the contents of the boxes you imply that there is a right answer for the activity. This is analogous to what students may experience in the classroom during an IBL lab exercise. Hopefully the "Thinking Inside the Box" activity provides TAs with more insight into the student perspective and helps them address students' concerns about "getting it right".

At the end of the activity it is important to have an open discussion with the TAs about their experience during the activity. For many TAs, this may be their first experience with inquiry-based learning and some may find it confusing or even unsettling. This discussion leads into a session intended to train the TAs regarding the purpose and effectiveness of IBL and a description of how we will use IBL in our lab exercises. Table 2 compares characteristics of inquiry-based approaches to more traditional approaches. (table taken from Franklin, W.A., no date). I've used this table to help TAs recognize the difference between the way they were taught as undergrads and the way I am asking them to teach as TAs.

Table 2. Comparison of inquiry based-approaches to traditional learning.

	Inquiry Based	Traditional
Principle Learning Theory	Constructivism	Behaviorism
Student Participation	Active	Passive
Student Involvement in Outcomes	Increased Responsibility	Decreased Responsibility
Student's Role	Problem solver	Direction follower
Curriculum Goals	Process oriented	Product oriented
Teacher's Role	Guide / facilitator	Director / transmitter

Literature Cited

Bailey, Christopher, T. 2010. Thinking Inside the Box. National Center for Case Study Teaching In Science, University at Buffalo, retrieved from **http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=398&id=398.**

Bohrer, K., B. D. Stegenga, and A. Ferrier. 2007. Training and mentoring TAs in inquiry-based methods. Pages 335-346, in *Tested Studies for Laboratory Teaching*, Vol. 28 (M.A. O'Donnell, Editor). Proceedings of the 28th ABLE Conference, 403 pages.

Bohrer, K., A. Ferrier, D. Johnson, and K. Miller. 2008. TA training workshops. Pages 67-126, in *Tested Studies for Laboratory Teaching* Vol 29 (K.L. Clase, Editor). Proceedings of the 29th ABLE Conference, 433 pages.

Boone, George C. 2004. Scientific Inquiry: Examining the Process of Science, in *Tested Studies for Laboratory Education*, Vol 25. (M.A. O'Donnell, Editor). Proceedings of the 25th ABLE Conference, 414 pages.

Franklin, Wilfred, A. (no date) Inquiry Based Approaches to Science Education: Theory and Practice retrieved from: **http://www.brynmawr.edu/biology/franklin/InquiryBasedScience.html.**

Roehrig, Gillian, H., J.A. Luft, J.P. Kurdziel, and J.A. Turner. 2003. Graduate Teaching Assistants and Inquiry-Based Instruction: Implications for Graduate teaching Assistant Training, *J. Chem. Education* 80 (10): 1206-1210.

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