PHYSIOLOGY BOOT CAMP: AN INTENSIVE STAFF TRAINING MODEL FOR LABORATORY COURSES WITH HIGH ENROLLMENTS

Angela M. Seliga, PhD[1] and Girija I. Bhonsle[1,2]
Departments of Biology[1] and Psychology[2], Boston University, Boston, MA 02215

INTRODUCTION

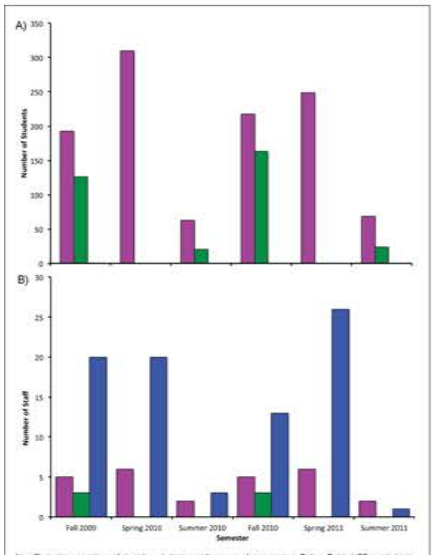
Staff Training Models
Several universities have training models for graduate teaching assistants (TAs) or teaching fellows (TFs) for laboratory courses [3, 8].

- Models include: Pre-semester orientations [2, 5], seminar-style courses and mentoring programs [2]
- Commonly used techniques: seminar or workshop courses, role playing games, video evaluations, and weekly lab meetings [2, 5]

Boston University's Approach

- *Training Biology TFs at BU*
  - All BU graduate students attend a one-day orientation, which includes a practice teaching session
  - "A Bridge to Knowledge": current model for STEM disciplines, the last 10 years in the Biology department, as a 9 week, workshop-based course
- *BU's Physiology Courses*
  - 200-level lecture and 3-hour laboratory course for health science majors (HS; physical therapists, occupational therapists, athletic trainers, and nutrition students)
  - 300-level lecture and 3-hour laboratory course for biology-related majors (BR; bio medical engineers, neuroscience, and human physiology, majority are pre-med)
- *Evolution of BR Physiology at BU*
  - Pre-Fall 2009, staff training included weekly lab sessions and the on-call availability of the Head TF (graduate student)
  - Historically, only experienced TFs were assigned, but graduations without regular replacements decreased the pool of physiology TFs
  - Due to changes in graduation requirements, physiology students now include biomedical engineers and seven-year liberal arts/medical education dual degree students
  - The number of physiology students fluctuates (see Figure 1A), which causes the number of staff members to change accordingly (see Figure 1B)
  - Currently, ~ ½ of physiology TFs do not have physiology backgrounds
- *Undergraduate Assistant (UA) Program*
  - Began in 2005 for the BR course, modeled after an existing UA program in the introductory biology laboratory courses at BU [4]
  - Initially, invited students who received an A- or better to volunteer to assist with one lab section/week for a semester
  - Currently, the number of volunteers exceeds the available slots, permitting 2 UAs/lab section and assigned UAs are recommended by his or her TF
  - In Spring 2010, students can be credit UAs by enrolling in a 2-credit seminar course adapted from "A Bridge to Knowledge" and attending weekly prep sessions
  - While largely successful, the role of UAs depends on the experience of the TF, which can lead to an over- or under-utilized UA
- *Addition of a Lab Coordinator*
  - Created to act as the liaison between the faculty members, Instructional Laboratory Director, TFs, and UAs (see Figure 2), as well as teach 4 labs/week, the credit UA course, update the lab curriculum, and organize outreach programs
  - Two additional staff training components: an orientation meeting to explain expectations, and weekly grading sessions with new TFs to establish grading consistency [1, 2]
  - Post-semester evaluations suggested the need for a more thorough staff training regi men prior to the beginning of the semester

FIGURE 1: BU PHYSIOLOGY

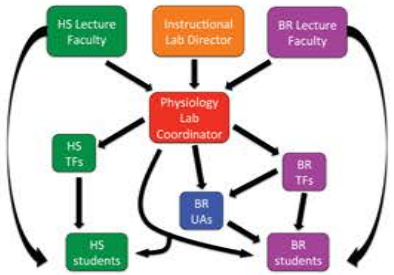


A) Fluctuating populations of physiology students over the course of six semesters. Biology-Related (BR; purple bars) Physiology is offered year round, while Health Science (HS; green bars) Physiology is only available in the fall and summer semesters.
B) The number of TFs assigned to HS and BR Physiology varies due to student enrollment. Fewer students enroll during summer semesters; therefore, the Coordinator teaches the HS course and no HS TFs are required. The UA program only exists for the BR course (blue bars) and the number is independent of the demand.

PURPOSE

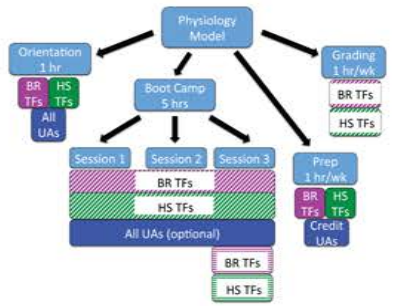
In Fall 2010-Spring 2011, Physiology Boot Camp was piloted as an intensive day of training for our teaching staff in addition to our existing training regimen of an orientation, weekly prep and grading sessions (see Figure 3).

FIGURE 2: HIERARCHY OF PHYSIOLOGY PERSONNEL AT BU

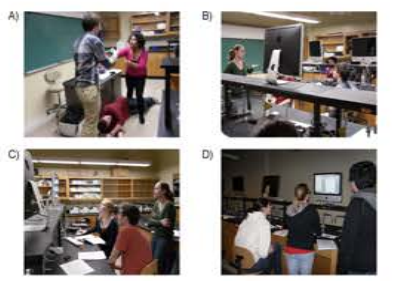


The Physiology Lab Coordinator (red) works closely with the HS (green) and BR (purple) faculty for the corresponding lectures for creation of the syllabi and lab manuals. The Coordinator also corresponds with the Instructional Lab Director (orange) who oversees all biology lab courses (budgets, scheduling, teaching and lab prep personnel). The Coordinator teaches 4 labs/week, and trains and evaluates HS and BR TFs, who teach the remaining sections of HS and BR students. Finally, the Coordinator trains, whereas BR TFs train and evaluate. BR UAs (blue) who volunteer to help teach the course.

FIGURE 3: PHYSIOLOGY STAFF TRAINING MODEL AT BU



In Fall 2010-Spring 2011, training of physiology staff included the following: a mandatory 1 hour orientation the first week of the semester to review expectations, lead a lab tour, and establish teaching partnerships; the new Boot Camp model on the first Saturday of the semester divided into 3 sessions (see Methods); weekly 1 hour prep sessions held on Friday afternoons to discuss the previous week and overview the following week; and weekly 1 hour grading sessions held after prep sessions to improve grading consistency. All BR TFs (purple) and HS TFs (green) are required to attend the orientation meeting and weekly prep sessions, but UAs (blue) are only required to attend the orientation and credit UAs attend the prep sessions. All 3 sessions of the boot camp are required for TFs new to physiology (diagonal lines), but optional for UAs. Repeat (horizontal lines) BR and HS TFs were required to complete session 3 on his or her own time. New TFs were also required to attend weekly grading sessions.



A) Three UAs taken during Session 2's role-play scenario of a student fainting during class.
B) A TF giving her presentation during Session 2 while a student continuously interrupts with questions.
C) A TF and two UAs working on the first lab assignment during Session 3.
D) Three UAs without a TF working on troubleshooting the software during Session 3

METHODS

Opening

- Scheduling required attendees
  - Doodle Poll [6]
- First lab assignment was provided
  - TF/UA teaching teams were assigned and introduced
- New TFs were told to prepare a 5 min presentation on any topic
  - UAs volunteered to play different "bad" student roles
    - Rude student: arrived late, verbally and non-verbally disruptive
    - Wrong place student: asked for directions to a different class
    - Talking students: constantly chattered
    - Emergency situation: fainted
    - Questioning student: asked questions relentlessly
- Recruited former UAs to assist with Session 1 skits

Session 1: Skits (adapted from [7])

- Ethics scenario
  - How to handle friendships with students
- Policy scenario
  - How to handle the end of lab chaos

Session 2: Role-play (adapted from [7])

- TFs and UAs practiced teaching
  - Coordinator evaluated current teaching skills
  - Group discussion of each teacher's strengths and weaknesses with regards to the lesson and their response to the disruptions
  - Debate alternative approaches to each situation

Session 3: First lab

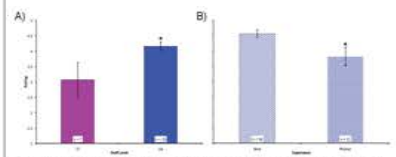
- TF and UA teaching partners completed modified version of first lab
  - Established partnerships in this team-building situation
  - Learned layout of classroom and operated teaching computers
  - Performed lab procedures correctly and incorrectly to learn how to help students troubleshoot
  - Answer post lab questions
- Coordinator graded post-lab questions to show grading technique

Closing

- In post-Boot Camp evaluations, TFs and UAs rated the following on a scale from 1 (too little) to 5 (adequate): quantity of information, relevance of information, enjoyment level, and educational value. Session 3 had additional ratings for clarity of training procedures and adequacy of the orientation meeting in preparation. TFs assigned in the fall did not complete "A Bridge to Knowledge", but TFs in the spring had.
- The TFs and UAs are also encouraged to provide constructive feedback, that the Coordinator does later incorporate in curriculum development [9].

SESSION 1: SKITS

FIGURE 4: ENJOYMENT VALUE AND RELEVANCE OF INFORMATION



A) The mean (±SE) rating of the enjoyment of the information across staff level (TF vs UA), regardless of experience. * indicates a significant ($p<0.05$) difference.
B) The mean (±SE) rating of the relevance of the information across experience (new vs repeat), regardless of staff level. *indicates a significant ($p<0.05$) difference.

SESSION 2: ROLE-PLAY

TABLE 1: ONE-WAY ANOVAs

Quantity				Relevance			
Staff Level		Experience		Staff Level		Experience	
TF (n=7)	UA (n=18)	New (n=16)	Repeat (n=9)	TF (n=7)	UA (n=18)	New (n=16)	Repeat (n=9)
3.14 ± 0.26	3.17 ± 0.15	3.13 ± 0.12	2.99 ± 0.24	3.57 ± 0.53	4.28 ± 0.16	4.06 ± 0.27	4.11 ± 0.26
Enjoyment				Value			
Staff Level		Experience		Staff Level		Experience	
TF (n=7)	UA (n=18)	New (n=16)	Repeat (n=9)	TF (n=7)	UA (n=18)	New (n=16)	Repeat (n=9)
3.57 ± 0.43	4.17 ± 0.12	4.00 ± 0.15	4.00 ± 0.33	4.29 ± 0.42	4.28 ± 0.21	4.31 ± 0.24	4.18 ± 0.33

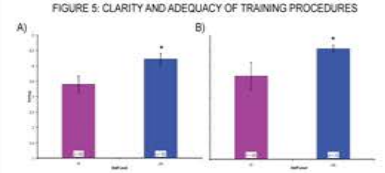
TABLE 2: TWO-WAY ANOVAs

Quantity				Relevance			
TF		UA		TF		UA	
New (n=4)	Repeat (n=3)	New (n=12)	Repeat (n=6)	New (n=4)	Repeat (n=3)	New (n=12)	Repeat (n=6)
3.25 ± 0.25	3.00 ± 0.58	3.33 ± 0.14	2.83 ± 0.31	3.25 ± 0.85	4.00 ± 0.58	4.33 ± 0.19	4.17 ± 0.31
Enjoyment				Value			
TF		UA		TF		UA	
New (n=4)	Repeat (n=3)	New (n=12)	Repeat (n=6)	New (n=4)	Repeat (n=3)	New (n=12)	Repeat (n=6)
3.25 ± 0.25	4.00 ± 1.00	4.25 ± 0.13	4.00 ± 0.26	4.50 ± 0.29	4.00 ± 1.00	4.25 ± 0.30	4.33 ± 0.21

- Table 1 includes the mean rating (±SE) and number of evaluations for TFs and UAs, regardless of experience (Staff Level) and New and Repeat, regardless of staff level (Experience). According to One-way ANOVA tests, there are no significant differences.
- Table 2 includes the mean rating (±SE) and number of evaluations for TFs and UAs at each experience (New and Repeat). According to Two-way ANOVA tests, there are no significant differences.
- Only significant differences among the staff are presented (see Figures 4-6) for Sessions 1 and 3, but similar analyses were performed.

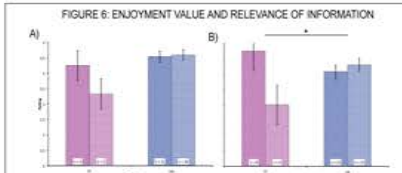
SESSION 3: FIRST LAB

FIGURE 5: CLARITY AND ADEQUACY OF TRAINING PROCEDURES



A) The mean (±SE) rating of the clarity of the training procedures across staff level (TF vs UA), regardless of experience. * indicates a significant ($p<0.05$) difference.
B) The mean (±SE) rating of the adequacy of the orientation meeting across staff level (TF vs UA), regardless of experience. * indicates a significant ($p<0.05$) difference.

FIGURE 6: ENJOYMENT VALUE AND RELEVANCE OF INFORMATION



A) The mean (±SE) rating of the enjoyment of the information a 2x2 design: new and repeat TFs, and new and repeat UAs. There are no significant differences.
B) The mean (±SE) rating of the relevance of the information in a 2x2 design: new and repeat TFs, and new and repeat UAs. * indicates a main effect of staff level ($p<0.05$) significant difference.

CONCLUSIONS

- Regardless of experience, UAs benefited the most overall from the Boot Camp model
- Session 3 showed to be most helpful for new TFs
  - Repeat TFs were well trained prior to the Boot Camp; thus, participation is only necessary when equipment and/or lab exercises change.
  - The Coordinator's time spent training the teaching staff decreased from approximately 5 hours/week to only 2 hours/week.
- HS TFs requested UAs, and former HS students express a desire to be a UA.

FUTURE DIRECTIONS

- Divide the sessions into blocks of time perhaps spread over two days:
  - It was a long day and some of the material covered was already known from the Biology TF seminar course
  - However, the time frame when staff's schedules are finalized is less than one week prior to the first lab
- Cover Sessions 1 and 2 in small discussion teams:
  - Each team will perform the skits, discuss, and then share their thoughts
  - The role-play scenarios will be performed as before; except teaching teams will discuss and then share their thoughts with everyone
- Incorporate modified post-labs of our more technical labs into Session 3
- Repeat TFs will grade Session 3 post-labs to improve grading consistency

REFERENCES

1. Berkhamer, R. & Cordon, A. (2002). Effective methods of training biology laboratory teaching assistants: grading consistently. Tested Studies for Laboratory Teaching. Proceedings of 23rd Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 23. 325-342.
2. Bohrer, K., Ferrier, A., Johnson, D., & Miller, K. (2008). TA training workshops. Tested Studies for Laboratory Teaching. Proceedings of the 29th Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 29. 67-126.
3. Gappa, L. (1991). A professional teaching assistant program: custom designing for your institution. Journal of Staff, Programs, and Organizational Development. 9. 83-91.
4. Godnick, E. (2002). Guide for Teaching Fellows and Undergraduate Assistants. Department of Biology, Office of Introductory Biology, Boston University, Boston, MA.
5. Haag, M., Christopher, K., Cummings, J., Dickey, J., & Glider, B. (2000). Effective methods of training biology laboratory teaching assistants. Tested Studies for Laboratory Teaching. Proceeding of the 21st Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 21. 430-444.
6. Hodson, R.C. & Nickle, T.C. (2011). Teaching and technology: web meetings for laboratory education. Tested Studies for Laboratory Teaching. Proceedings of 32nd Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 32. 361-367.
7. Lumsden, A.S. & Morgan, J.G. (2003). Effective methods of training biology laboratory teaching assistants IV: the use of skits, a teaching plan, and dealing with plagiarism and grading. Tested Studies for Laboratory Teaching. Proceedings of the 24th Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 24. 223-238.
8. Unruh, D. (1987). Teaching assistant training: a guide for developing departmental TA training programs. Office of Instructional Development, University of California, Los Angeles, CA.
9. Vigna, J., Cymbola, J., & DenUyl, J. (2011). Curriculum development as professional development: a model for adjunct and graduate student instructors teaching multi-section lab courses. Tested Studies for Laboratory Teaching. Proceedings of 32nd Workshop/Conference of the Association for Biology Laboratory Education (ABLE). 32. 404-405.

ACKNOWLEDGMENTS

The authors appreciate the many contributions of HS and BR TFs, as well as BR UAs, to the development of HS and BR physiology courses and their specific feedback regarding staff training. In particular, the authors wish to thank Miss Andrea N. Campbell for her data collection and analyses of the Boot Camp evaluations.