TA Report on use of Undergraduate Learning Assistants in Teaching Introductory Physics

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Over the years I have been a graduate student at UT, I have been a TA for Physics 303K/L over a dozen times, and for the past three semesters, I have taught the Matter & Interactions variant of the course. As such, I believe I have a fairly well developed perspective on how to implement instructional resources to achieve maximal benefit for our students. One particular change to our pedagogical approach I strongly advocate is the inclusion of undergraduate Learning Assistants (LA), who have expanded the possibilities of how a large physics class can be taught.

The typical instructor to student ratio in a large introductory course inherently minimizes contact between teacher and learner. Although our students tend to be independent and rely on fellow students as study resources, beginners at physics can benefit greatly from cogent and correct explanations offered by experienced guides. As a TA, I see my effectiveness as heavily dependent on the interaction I can foster between our teaching team and students. However, when the lecturer and TA comprise the entire teaching team, it difficult to extend help to any but the neediest students. LAs provide a unique way to expand our interaction with the class by lowering the barriers to teacher/student communication and injecting much needed manpower to address student needs.

One of the ways LAs benefit our program is by increasing our ability to reach students outside of class. Each of our LAs holds office hours for several hours a week and is available to meet with students one-on-one to discuss physics or effective study habits. This increased contact is beneficial to our students in a number of ways: they receive knowledgeable physics guidance, they feel more connected and sympathetic to the educational goals of the teaching team when interacting with a fellow undergraduate to whom they can easily relate, and they are given a boost in confidence and motivation by an accomplished student who is a mentor invested in their success. Each LA I have worked with has personal anecdotes which attest to the above. It is not uncommon for our students to be motivated to reach the top of their class in order to become an LA for future semesters.

In the discussion class which supplements lecture, LAs are indispensable to our current teaching methods. In these classes, students take part in computer modeling and group problem solving exercises. Due to the technical nature of programming and the difficulty of the advanced problems I select for groupwork, more instructors are needed to supervise students' work than a lone TA. Without LAs present, I do not see how we could effectively implement these kinds of valuable hands-on activities. Instead, the TA would have to revert to the role of additional lecturer delivering an hour of passive learning to students, which I see as a less powerful instructional method. I have played both roles in my experience as a TA and am strongly in favor of the present method. With three of us (myself and two LAs) manning a discussion class of approximately 25, there are ample opportunities for personalized physics instruction and rapport building.

LAs also attend the professor's regular lecture in which they take on a “Socratic” role, challenging students to defend their answers during the lecture's open discussion periods. This frequent interaction with LAs builds rapport among students as well, and keeps LAs in sync with the material students are grappling with.

Based on my discussions with and observation of LAs with whom I work, I would offer the following

practical guidelines to new LAs.

Guidelines for Effective LAs

1. Timeliness of office hours: The homework schedule of the course should be designed with office hours in mind, and vice versa. The use of online office hours is key in this regard, as the time we set aside to help students can be scheduled within the window of time students will most likely be working on assignments, which is in the evenings before assignments are due and throughout the day on Sundays. As an example of this point's relevance, when we scheduled homework deadlines for 11pm one semester, office hour participation was about an order of magnitude higher than when the deadline was 4am the following morning. We typically hold office hours between 7-10pm in the evening--clearly students were waiting until after this period to work on homework that was due at 4am! Assigning sufficiently challenging homework also plays a significant role in motivating students to utilize office hours.

2. Aggressive engagement in class: While almost all students will benefit from increased interaction with knowledgeable instructors, experience shows that very few students will actively seek help, even if they are struggling. Beyond increasing our access by holding additional office hours, I believe the solution to this problem is to actively engage students. In lecture and discussion class, this means not waiting until students ask a question, but rather proactively asking them questions. In lecture, an LA can ask nearby students, “So, what do you think the answer is? Why?” and critique their reasoning appropriately. In discussion class, an LA should actively observe students' work and try to point out mistakes. When listening to students having a physics discussion with their groupmates, an LA should consider joining the conversation if the group consensus is headed in the wrong direction or if the group's train of thought has reached an impasse.

3. Aggressive oversight outside of class: A useful technique to bring our instructional resources to bear on students who would benefit the most is to have LAs directly contact students via email. This is easiest to implement if, at the beginning of the semester, each LA is assigned to the group of students in the discussion class that LA attends. This way, the LA can obtain email lists of “their” students from CLIPS, sorted by discussion class. At the beginning of the semester, each LA should send an email to the students he is in charge of including a brief bio and statement of purpose as an LA. Later on in the semester, LAs should send emails to students who scored in the bottom 25% of the class on exam 1 and exam 2, offering to meet with these students in person to go over the exam, discuss study habits, or to work on the ongoing course material. If there is enough response, the LA can announce on-ground office hours to meet with a number of interested students. This kind of personalized communication will have a positive effect on how students view our teaching team and will give many of them the confidence to succeed, whereas otherwise they might languish in a more typical, depersonalized setting.