AC 2010-2039: USING A WEBSITE AND WIKI AS A SUPPORT TOOL FOR TEACHING ASSISTANTS

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Using a website and wiki as a support tool for teaching assistants

Abstract

Employing students as teaching assistants (TAs) in laboratory sections of large courses reduces faculty’s teaching commitments and provides valuable teaching experience for future faculty. However, it also presents challenges, such as inexperienced TAs and high turnover between semesters. New tools are needed to ensure high quality of lab instruction, consistent across all sections of a large course, as well as from one semester to the next. We have studied the effectiveness of one such tool, a website created to support TAs who teach laboratory sections of two large introductory electrical engineering (EE) courses. Our findings suggest high effectiveness of the website as a repository of established reference information, which is extremely helpful for beginning instructors because it allows them to learn the lab procedures, foresee student questions, and consistently grade lab reports. At the same time, we have found a reluctance of TAs to use the wiki component by editing or adding information to it. Focus groups have revealed the causes of this reluctance, which we discuss in this report.

Introduction

The use of student teaching assistants (TAs) offers economic benefits to universities and departments by allowing them to reduce faculty’s teaching commitments in introductory courses. Furthermore, it provides TAs with teaching experience, which is especially valuable for students who may desire to become faculty\(^1\). At the same time, having students teach laboratory and/or discussion sections in undergraduate classes presents challenges to providing high-quality, consistent undergraduate education. High TA turnover between semesters, a lack of teacher training, and varying levels of motivation to teach are among the factors that complicate this system and can erode the quality of undergraduate education.

To address these common challenges, it is important to ask: “What tools or support can institutions provide that will help TAs learn about teaching and improve their teaching practice?” Research indicates that perceived support and access to teaching resources increases self-efficacy, or confidence in one’s own ability to teach\(^2,3\), which has been shown to improve student achievement and motivation in the classroom\(^4,5,6,7,8\). We have investigated how and to what extent a website created for TAs as lab instructors can provide this support.
Background

A website was created for TAs teaching laboratory sections for two large EE courses (total enrollment exceeds 500 students per year). The two courses contain similar material, but one is targeted at EE majors while the other is for non-majors. Each lab section has up to 18 students and is taught by one TA. Between the two courses, there are about 10 TAs and 20 lab sections each semester. TAs' job responsibilities include teaching lab sections, grading lab reports, leading discussion sections, and holding office hours.

The website contains information such as lab procedures, sample solutions, and sample lab data, which were provided by the primary instructor. After using the website for several semesters, a wiki component was added, offering the lab instructors a new resource, through which they can share concerns or advice about teaching particular projects and lab procedures. The wiki has a page for each project, and each page has sections such as “Common Mistakes” and “Frequently Asked Questions” where TAs can post information about their teaching experiences. Thus, the wiki accumulates advice for other TAs involved in teaching the course during the current and/or future semesters. As one TA noted,

“While lab manuals provide a guideline for students to follow, they often fail to describe the minute yet sometimes crucial intricacies and idiosyncrasies of a given reaction. Unfortunately, in the real world such knowledge can only be acquired by trial and error. Ideally, there should be a mechanism available by which one generation of TAs can pass on their experiential knowledge to the next.”

More information about the wiki (including screen shots) is provided in the Appendix.

Research Questions and Methodology

Our work addresses the following questions: 1) In what ways do TAs use the website, and which of its parts are most helpful for TAs’ teaching and the improvement of their teaching? 2) Is there any difference in website usage between the new TAs and the TAs who have already taught the course? 3) What prompts TAs to add information to the wiki, and what inhibits them from adding information?

Our research tools include online questionnaires for TAs, focus groups, and statistics about website usage. We gathered data from two semesters — winter 2009 (Jan.–Apr.) and fall 2009 (Sept.–Dec.). There were eleven and nine TAs, respectively, during these semesters. The questionnaires were conducted at the beginning and at the end of each semester (i.e., pre-survey and post-survey). The surveys included questions about the familiarity of TAs with the website and their intentions to use it. We also included open- and closed-ended questions designed to measure the instructors’ self-efficacy (i.e., level of confidence or comfort with their teaching role). The post-survey included the same questions about self-efficacy to facilitate comparison with the pre-survey, as well as additional questions about TAs’ experiences with the website.
We conducted focus groups at the end of each semester, where we gathered qualitative data about the TAs’ experiences using the website, solicited their comments on its value along with explanations of their usage patterns, and discussed the role of the website compared with other resources available during the semester. Since many questions focus on the attitudes of individual instructors and their motivation, their responses in focus groups have provided the most valuable insight.

Results and Discussion

Benefits of the Website

In all surveys and focus groups, the TAs unanimously emphasized the great value of the website as a repository of sample solutions, lab data, and explanations on streamlining the lab procedures. A TA explained that the “[website] helped me to anticipate what could go wrong so I could help [students] easier. It also helped so I knew for sure what the outcome should be.” Another said, “It makes grading smoother and it gives a good summary of what to put on the chalkboard for students. It makes lab introductions smooth.” The usefulness of the website was also seen in the usage statistics: for the winter and fall semesters, there were 214 and 743 logins for the website, respectively. That represents an average of roughly 1.2 and 5.2 logins per TA per week, respectively. The jump in website usage in the fall might be due to more new TAs in the fall semester (8 out of 10) than the winter semester (3 out of 8).

We asked TAs why they chose to use the website and found that they primarily used it for its repository of information and solution sets, and for quick reference. One TA said, “It’s convenient for when you want to really quick look at something, you’re not in a staff meeting and you don’t necessarily want to wait for someone else to get back to you. It’s someplace where you can look for real quick stuff. But if you have a more complicated question, it’s not necessarily covered on the wiki.” TAs agreed that the website was particularly helpful to them during their first semester teaching. A TA commented, “Once you’ve actually gone through the first time, you kind of know those little things, like ‘Oh yeah, this is this lab, so remember to do this.’ So you know what to expect.”

The wiki component of the website was much less frequently used, but some TAs noted that they used the wiki to record errors found in the lab book and to see concepts explained in different ways. As one TA noted: “In terms of the wiki, when I look at old homework solutions, sometimes you can see things explained in different ways, that I really wouldn’t have thought of, because there’s definitely tons of different ways to explain various problems. I think that’s helpful.”
Low Participation in the Wiki

Despite positive comments about the usefulness of the wiki, the TAs’ answers to the questions regarding their contributions to the wiki reveal low participation in the wiki. Table 1 shows post-survey responses for winter and fall semesters 2009 in the table (W’09 N=6, F’09 N=8).

<table>
<thead>
<tr>
<th>How often did you...</th>
<th>Never</th>
<th>Rarely (1-3 times)</th>
<th>Sometimes (4-6 times)</th>
<th>Often (7+ times)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider adding information to the wiki?</td>
<td>33% (W’09)</td>
<td>67% (W’09)</td>
<td>0% (W’09)</td>
<td>0% (W’09)</td>
</tr>
<tr>
<td></td>
<td>0% (F’09)</td>
<td>50% (F’09)</td>
<td>50% (F’09)</td>
<td>0% (F’09)</td>
</tr>
<tr>
<td>Actually add information to the wiki?</td>
<td>83% (W’09)</td>
<td>17% (W’09)</td>
<td>0% (W’09)</td>
<td>0% (W’09)</td>
</tr>
<tr>
<td></td>
<td>37.5% (F’09)</td>
<td>25% (F’09)</td>
<td>37.5% (F’09)</td>
<td>0% (F’09)</td>
</tr>
<tr>
<td>Consider editing information on the wiki?</td>
<td>33% (W’09)</td>
<td>67% (W’09)</td>
<td>0% (W’09)</td>
<td>0% (W’09)</td>
</tr>
<tr>
<td></td>
<td>25% (F’09)</td>
<td>75% (F’09)</td>
<td>0% (F’09)</td>
<td>0% (F’09)</td>
</tr>
<tr>
<td>Actually edit information on the wiki?</td>
<td>100% (W’09)</td>
<td>0% (W’09)</td>
<td>0% (W’09)</td>
<td>0% (W’09)</td>
</tr>
<tr>
<td></td>
<td>75% (F’09)</td>
<td>25% (F’09)</td>
<td>0% (F’09)</td>
<td>0% (F’09)</td>
</tr>
</tbody>
</table>

After having noticed the low participation (only 2 edits/additions to the wiki) in the winter semester, we specifically encouraged the TAs at the staff meeting at the beginning of the fall semester to participate in wiki. As the table shows, participation somewhat increased in the fall (19 edits/additions) but the overall pattern of reluctance to contribute has persisted.

Barriers to Using the Wiki

Time. When answering the survey questions about the factors that influenced their decisions to contribute or not contribute to the wiki, the majority of TAs listed time involved with contributing. The question asked TAs to "rate how the following factors influenced your decisions to contribute to the wiki (or not)?" with possible responses being "strong influence", "influence", "slight influence", and "neutral" either against or toward contributing to the wiki. In both the winter and fall, 50% of the TAs indicated that time was a "slight influence against contributing." Moreover, 17% in the winter and 25% in the fall indicated it as "influence against contributing."

In focus groups, the most commonly cited reason for not using the wiki was a lack of time. Many were enthusiastic at the beginning of the semester about the potential of the wiki to support their teaching, but as the semester progressed, these TAs were unable to find the time to use the wiki. One TA commented, "[At] the beginning of the semester I had a lot more free time, and as the semester went on I got busier and it was hard." Another TA explained that he sometimes had comments to share on the wiki, but “if you want to write it in a way that’s actually useful for other people, it would take a little bit more time than you can spend.” A third TA mentioned that there was often a delay between a noteworthy issue in lab and the time when she could have written about the issue. She said, “A lot of times I’ll think of something in lab,
but I’m busy fixing it, and by the time I’m done fixing it and have a chance to do something I’ve already forgotten.”

**TAs doubt that others will read their comments.** A second reason why TAs were reluctant to post to the wiki was their sense that others may not ever read their contributions. When asked what are the barriers to using the wiki, one TA replied, “Thinking that people aren’t really going to be looking at the stuff you’re posting and using it.” While they acknowledged that hearing tips and advice from experienced TAs is helpful, they were hesitant to post their own comments from which future TAs can benefit. A TA described this dilemma: “Whenever you add something to the wiki, it’s not going to be helpful for that semester; it’s only going to be helpful for the next semester. So, it’s just hard to convince people to kind of invest in the future.”

**Easier to learn from other TAs in person.** TAs indicated that they do rely on and benefit from the help of experienced TAs who have taught the same course in the past. However, the easiest way they have found to learn from experienced TAs is to talk with them in person. One TA commented, “It is just easier to ask…other TAs to get feedback [than to use the wiki].” Another said, “I think there will always be at least one or two people who have been a TA before, and if I have any questions I just ask [them] usually. So I don’t really need to go to the wiki because [they have] already done it the last three times. If there’s an error or something, I just check with [them] first.”

One TA suggested that the best way to learn from other TAs is to observe their teaching or office hours, and the wiki cannot provide this type of support: “It’s always good to have insight in how other people teach so you can compare against your own, but the wiki doesn’t really have the resources to do that. Because if you’re teaching, it's mostly office hours and discussion, mainly, and the best way to learn off someone else’s teaching is to go to their office hours or discussion. The wiki can’t really substitute for that. Although, it can probably supplement, but it’s not that important.” Participants generally agreed that talking with and observing experienced TAs in person tended to be the most effective and convenient way to learn from them.

**Wiki has very little content so far.** Because the wiki is relatively new, it does not contain a lot of content posted by TAs themselves. Understandably, lack of content is a reason why TAs said they don’t use the wiki. One TA commented, “I think somehow you need to give the feeling of completeness so that people will go there first, as opposed to somewhere else.”

**Suggestions for Wiki Improvement from TAs**

TAs suggested that it would be helpful if the wiki had a teaching reflection component, in addition to practical tips and advice. One person commented, “It would be nice if we had an avenue for discussing, ‘Well, what is the concept that is behind this lab?’ Because a lot of the time it seems we’re just so focused on getting the students done and out that we’re not really teaching anything.” Another said, “If [the wiki] were spread to the discussion [in addition to the lab], then it would be more conducive to reflecting on how you teach and what method worked for helping the students understand a specific concept.” We incorporated this suggestion into the
wiki for the second semester by creating a page for each discussion session where the TAs could reflect on their experience teaching that material. These new pages led to substantially more participation on the wiki: 9 of the 19 edits/additions to the wiki for the second semester were on the new pages for reflection about teaching discussions.

**Summary and Conclusions**

We have found that the conventional component of the instructors’ website (rather than the wiki) was the most valuable for the TAs, serving as a repository of reference information. Availability of this resource was especially important for the TAs who were new to teaching the course, because it ensured their success and consistent teaching in many sections across the course and from one semester to the next. TAs who repeatedly taught the same course felt less need to use this resource. The wiki component of the instructors’ website, which allows participants to edit and upload information on the website and could serve as a new venue for communication among instructors, has been much less popular and served only a secondary role.

For a variety of reasons, such as lack of time, TAs have been reluctant to contribute their comments to the wiki. Lacking a richness of stored information, the wiki was not their first choice when the TAs were looking for information or advice. As a tool for fostering their professional development, the wiki component of the website plays a secondary role compared with staff meetings and personal contacts with faculty, staff, and experienced TAs. The TAs recognized the benefit of the wiki’s around-the-clock availability, but noted that it helps to resolve only simple questions. Given the choice, TAs prefer personal contacts for learning from others' experience, rather than search the wiki for their comments.
References

Appendix: Wiki Details

The following figure shows the home page of the wiki for the two courses we studied. It provides links to the specific pages for each experiment, as well as a few notes that apply for all the experiments.

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**Welcome to the EECS 215/314 Lab GSI Wiki**

Our goal is to record and retain the experiences and insights of the intro lab GSIs.

In these pages below, there are explanations of the intent for the questions, errata and a place to post problems/complaints/suggestions. Use this to post errors and suggestions for the next iteration of the lab manual.

Also, please make a note in the computer section (which exists under each lab page) every time an unexplained error occurs with the LabView.

- Information for Instructors about Supplementary Materials

**EECS 215 Experiments**

- DC Lab
- AC Lab
- Op Amp Lab
- Transients Lab
- Filter Lab
- Audio Lab

**EECS 314 Experiments**

- DC Lab
- AC Lab
- Transients Lab
- Filter Lab
- Op Amp Lab
- Temperature Controller Lab

**EECS Lab Attendance Sheet**

- For convenience, a scanned copy of Professor Ganago's sign in sheet... [EECS Lab Attendance Sheet]

**Syncing Passwords**

- Procedure
The following two figures show one of the pages for a specific experiment. At the top, there are links to sample solutions and data, as well as the procedures that the students are given. Then the “Instructor Comments” section provides a forum for TAs to share their knowledge about performing the experiment. Some of the information in this section was provided by the experienced TA who set up the wiki initially. In addition, there were a couple of major contributions by TAs during the fall 2008 semester (the first semester the wiki was in place): (1) the “Connecting Speakers” comment, and (2) the comment in the “Frequently Asked Questions” section. Each of these comments points out an issue that could occur in lab and describes how to resolve the issue.

### AC Lab (EECS 215)

#### Sample Solutions / Data

NOTE: Each of the solutions / data sets presented here is a sample. They are meant to give instructors an idea of what the solutions / data might look like. Student solutions and data may deviate from those given here.

- Pre-Lab Solutions
- Post-Lab Solutions
- In-Lab Tear-Out Pages
- In-Lab Printout

#### Student Files

- Cover Page
- Streamlined In-Lab Procedure

#### Instructor Comments

##### Common Mistakes

#### Sync Port vs. Output Port on Function Generator

If students have trouble getting a waveform to appear on the oscilloscope screen or see only a square wave, check that the coaxial cable is connected to the Output port on the function generator, and not the Sync port. Next, check that the Output push-button is enabled.

#### Connecting Speakers

As stated in the manual, students can connect the white speakers in the lab to the function generator to listen to the tones produced by various waveforms. In 1616 EECS (aka The Showcase Lab), the speakers DO NOT have banana plug connectors, as stated in the lab manual. They have bare wires. In this case, it is easiest to connect them to the function generator using a BNC cable, with a BNC to mini-grabber adapter on the speaker end.
**Specific Notes**

1. When measuring the rise time of the square wave or pulse waveform, make sure student zoom in/adjust horizontal scaling enough so that the edge of the square wave is no longer sharp, but rather “stretched out,” as in the Figure 1 below. Also, inform students are using any of the measurement function on the oscilloscope, if they see a value such as <500ns (less than 500 ns), they need to adjust the horizontal scaling to get a more accurate measurement.

![Graph](image)

2. Measurement of the Noise Frequency and Amplitude is relatively arbitrary. Inform students that engineers usually define a noise level (e.g., -3 dB frequency), but for this measurement, they should just use their best judgment.

3. When using **Lab 2 Fourier Rise-Fall Time.vi** and entering the amplitude of the Square Wave, if $V_{pp}$ is entered, the field will automatically reset to 1.9 $V_{pp}$. This is a hardware issue. This will not affect the students’ ability to make the rise time measurements.

4. The question regarding Equidistant Peaks does not need to be answered. This question relies on a function that was available in older model oscilloscopes but is no longer available on the Agilent DSO 3102A.

**Frequently Asked Questions**

- Students frequently ask how to set the particular dB/div and Hz/div settings on the oscilloscope. The best method to handle this is to show them how to change the values, and emphasize that they should simply use the values that allow them to get the best measurement (i.e. they can see the details of the FFT). Obtaining specific values is not important.