Student and Teaching Assistant Perspectives on Characteristics of an Effective Teaching Assistant

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Student and Teaching Assistant Perspectives on Characteristics of an Effective Teaching Assistant

Abstract

In addition to their research and coursework responsibilities, many graduate students are placed in the role of teaching assistant. Theoretically, this position will benefit both the student and the department by allowing the graduate student to gain valuable classroom experience while filling a teaching need in the sponsoring department. However, in practice, these experiences can range from rewarding to challenging for both the teaching assistants and the students under their care. These challenges raise an important question, what are the characteristics of an effective teaching assistant? In assessing teaching effectiveness, both the affective and cognitive domains must be taken into account. This study seeks to address the affective aspect for both students and teaching assistants by assessing their perceptions of what makes an effective teaching assistant. As such, the objectives of this study are to examine any gaps between student and teaching assistant perceptions, assess differences between different types of teaching assistant roles (i.e. lab vs. lecture), and compare the results to accepted best practices from literature and the personal experience of experienced teaching assistants. Surveys consisting of Likert scale and open-ended questions were given to teaching assistants and students. The study utilized mixed methods with descriptive statistics used to assess the Likert results and a qualitative analysis of the open-ended questions to determine common themes. Since teaching assistant roles can vary widely, several different types of classes were assessed within the environmental and water resources engineering curriculum. Both laboratory and lecture courses were assessed with students of varying grade levels. Better understanding of student and teaching assistant expectations can provide valuable insight towards the design of graduate teaching assistant training and support programs to help foster a more beneficial and positive experience for both the teaching assistants and their students.

Introduction

In addition to their coursework and research responsibilities many graduate students are given the role of teaching assistant (TA). Although the exact responsibilities of the TA role can vary widely across departments and courses, instruction of students via large lectures, small groups, or laboratory settings is an included facet of the role. In theory, this TA role can provide a significant benefit to both the graduate students and the sponsoring department. Graduating doctoral students have identified teaching as an area where they feel unprepared for future faculty positions[1]. Teaching aptitude has also been identified as one of the characteristics of successful doctoral graduates[2], so there is a clear need for graduate students to have experience with teaching during their studies. As graduate students who are typically closer in age to current students than tenured faculty, TAs have potential for more empathy and affective connection with the students they teach as they span the dual role of teacher and learner, which can provide a benefit to students.[3] In addition to the potential benefits for graduate students, TAs also help fill a need for instructors within a department at a reduced cost in comparison with additional full-time faculty[4].

However, despite the potential benefits of the role for all parties involved, the TA position is often the subject of scrutiny as parents and undergraduate students raise concerns about maintaining the quality of education[5]. TAs express difficulty in learning on the job and are often

placed in roles that can be highly challenging for even experienced teachers to succeed in (i.e. large courses, non-major students, etc.) with little to no formal preparation or training in appropriate pedagogy. Graduate students are often "good" students who are highly intrinsically motivated in their studies, so issues such as classroom management or motivating struggling students can seem foreign and overwhelming. There are many great tools available to help TAs as instructors. Significant research has been done on improving teaching methods and pedagogy leading to the development of research based instructional strategies (RBIs)[6,7]. This progress in pedagogy can benefit graduate TAs as well as full-time faculty; however, the TAs may be so overwhelmed with the task that they are unsure of where to even begin to seek improvement and growth. This work seeks to examine both student and TA perceptions of the role in order to begin the process of developing support programs to help TAs and their students benefit from this unique experience for both parties. It is important to recognize that significant research has been conducted examining the perceptions and implications of these perceptions in regards to full-time faculty members. However, this study is based upon the assertion that TAs occupy a role that, although similar to faculty, is unique and thus the initial assessment provided in this work may lead to further analysis of the TA role that can benefit the body of literature as whole. This work can contribute both in comparisons to existing work done with faculty and in elucidating important differences in the role of a TA.

While the cognitive domain is often the first considered, especially in Science Technology, Engineering, and Math (STEM) disciplines, the affective domain has been demonstrated to have a significant impact on student performance and learning outcomes[8,9]. This is especially true in terms of student motivation and self regulation[10-12]. Speer examined the impact held beliefs had on actual practice with mathematics instructors[13] and Singer examined the teaching paradigms of college faculty on instructional practices[14]. With these results in mind, this work is viewed as the first step of assessing both student and teaching assistant held beliefs and perceptions about the characteristics of an effective teaching assistant. The objective of the study is to examine these perceptions and assess any potential differences between student and teaching assistant perceptions or between subgroups of students.

Methods

A mixed methods survey was implemented with 12 Likert scale questions paired with a free response portion (Appendix A). The study was designed using a concurrent triangulation strategy (Fig. 1) as described in Creswell (2012)[15] because it was anticipated that quantitative results would need to be corroborated and expanded by qualitative responses.

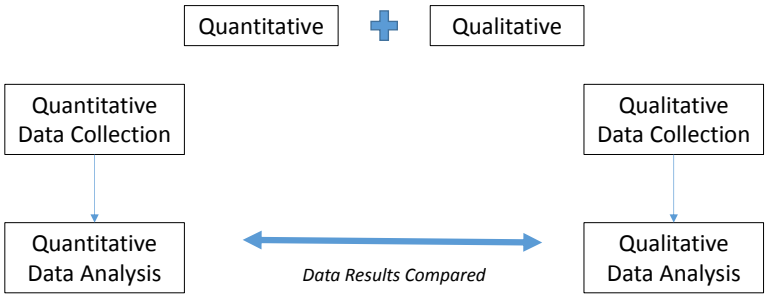

Figure 1: Concurrent Triangulation Strategy[15]

The Likert question stems all fill in the blank "An Effective Teaching Assistant____." These stems were developed in alignment with the guiding document of the civil engineering discipline, the American Society of Civil Engineers Body of Knowledge(ASCE-BOK)[16]. Within the ASCE-BOK Joseph Lowman's[17] categories of intellectual excitement and interpersonal rapport are used to describe effective teachers and these categories were also used in development of the Likert stems. The characteristics assessed by the stems are also drawn from the T^4E curriculum and ASCE ExCEEd program[18-20]. Some of the characteristics of these training programs are: use structured organization of content to guide the learner, use effective communication to keep learner engaged, and demonstrate enthusiasm for the subject matter, for teaching, and for learning[18]. The Likert scale survey allows for student and TA level of agreement with the given characteristics to be assessed. To help provide more resolution from the quantitative data, an additional question was added asking students to select the top 3 characteristics of an effective teaching assistant from the provided stems. The open-ended, qualitative stem was provided to allow participants to describe any aspects not covered by the Likert questions or provide more detail about the previous responses.

The survey was implemented voluntarily in water resources and environmental engineering courses with students ranging from sophomore to 5-year master's program students. Table 1 provides the courses surveyed and number of students.

Table 1: Courses Surveyed

Course #	Course Title	# of Students
3105	Mechanics of Fluids Lab	32
3171	Environmental Engineering Lab	39
3305	Mechanics of Fluids	71
3354	Engineering Hydrology	55
3372	Water Systems Design	22
4353	Design of Hydraulic Systems	20
5364	Groundwater Transport Phenomena	16

Unfortunately, department budget cuts resulted in a significant reduction of TA positions during the semester when the survey was implemented. Although all available TAs participated, this resulted in a much smaller sample size than anticipated with only 6 TA responses. Another result of the reduced TA positions was many students surveyed did not currently have a TA assigned to their course. These students were asked to reflect on prior experiences with TAs to guide their responses. Care was also taken to remind students that the survey was intended to assess their perceptions of TAs in general, not a specific evaluation of their current TA.

The Likert scale questions were analyzed using frequency distributions of the responses. Overall groups of students and TAs were assessed along with various sub-groups within the student sample. The ranking question was examined for the choice ranked 1st overall as well as the frequency of the characteristics being listed in the top 3 choices. The qualitative data was utilized to provide more depth to the quantitative responses. Representative quotations are presented with the results as well as the overall assessment of common themes from the blind coding of the responses. In any analysis of qualitative data, the background of the researcher is

an important component. The qualitative data was anonymized and categorized separately from the qualitative results by three individuals. Individual A, the corresponding author, is a former high school mathematics teacher now pursuing a doctoral degree in Civil Engineering with teaching experience both at the secondary and collegiate level and experience in teaching some of the courses surveyed, though not a current instructor. Individual B is a student in a 5-year bachelors and masters combined program in environmental engineering. Individual B also has experience in analyzing qualitative data gained during a summer research experience analyzing qualitative reflection data through video and written work. Individual C is another student in the 5-year program, however with no formal training or experience in coding qualitative data. After individual coding of the responses the results were compiled and agreement was sought in cases of discrepancy amongst the coding.

Results

Quantitative – Likert Scale

Due to the high levels of agreement (responses of 5- strongly agree or 4 - agree) with the Likert stems, a frequency plot was used to analyze the quantitative data

Participants in the study were civil and environmental engineering students enrolled in courses in the water resources and environmental sub-disciplines and the teaching assistants for those courses at Texas Tech University during the Fall 2014 semester. 255 students from 12 course sections (5 lab and 7 lecture) completed the survey. 22.5% of the students identified as female which is slightly higher than the overall college percentage of 16%, however a higher percentage of female students is characteristic of the environmental engineering sub-discipline. The three largest racial groups were Caucasian (63.8%), Hispanic (19.6%), and Asian (7.7%).

Frequency distribution tables were compiled from the Likert survey results for both groups (Students and TAs) and several subgroups within the student population. However, differences in results between the various sub-groups were negligible, so the decision was made to analyze the data for the students as a whole compared to TAs (Table 2 and 3). The majority of students and TAs responded to the question stems positively (selected a 4 or 5) indicating at least some level of agreement with all of the characteristics. In order to help elucidate differences in the results, they were ordered within the tables according to the frequency of a response of “strongly agree” (5).

Table 2: Student Responses Frequency Distribution

An Effective TA_____	5 strongly agree	4 agree	3 neither	2 disagree	1 strongly disagree
grades fairly	55.2%	40.8%	1.2%	2.4%	0.4%
able to explain difficult concepts	53.6%	33.6%	9.2%	2.4%	0.8%
treats all students with respect	52.0%	43.2%	4.0%	0.0%	0.0%
is easy to understand	50.0%	39.2%	6.4%	2.8%	1.2%
is well prepared	48.8%	43.6%	5.6%	1.2%	0.4%
is available outside of class	42.8%	48.4%	7.6%	1.2%	0.0%
gives prompt feedback on assignments	42.8%	45.2%	7.2%	4.0%	0.4%
cares about students success	40.0%	42.4%	15.6%	1.2%	0.4%
is enthusiastic about the subject	34.0%	41.2%	21.6%	2.0%	0.4%
Encourages students to ask questions	30.4%	46.4%	20.0%	1.6%	1.2%
is an expert in the content area	27.2%	45.2%	23.2%	3.6%	0.4%
has a sense of humor	22.0%	40.4%	31.6%	5.2%	0.8%

Table 3: TA Responses Frequency Distribution

An Effective TA_____	5 strongly agree	4 agree	3 neither	2 disagree	1 strongly disagree
grades fairly	83.3%	16.7%	0.0%	0.0%	0.0%
is well prepared	83.3%	16.7%	0.0%	0.0%	0.0%
is easy to understand	83.3%	16.7%	0.0%	0.0%	0.0%
treats all students with respect	66.7%	33.3%	0.0%	0.0%	0.0%
encourages students to ask questions	50.0%	50.0%	0.0%	0.0%	0.0%
is enthusiastic about the subject	50.0%	33.3%	16.7%	0.0%	0.0%
gives prompt feedback on assignments	50.0%	50.0%	0.0%	0.0%	0.0%
is available outside of class	33.3%	66.7%	0.0%	0.0%	0.0%
cares about students success	33.3%	50.0%	16.7%	0.0%	0.0%
is an expert in the content area	16.7%	16.7%	50.0%	16.7%	0.0%
has a sense of humor	0.0%	33.3%	50.0%	16.7%	0.0%
is able to explain difficult concepts	0.0%	100.0%	0.0%	0.0%	0.0%

The frequency of strong agreement with "Grades Fairly" was the greatest for both students and TAs although TAs had "is well prepared" and "is easy to understand" tied for the most frequent with grading fairly. This is an expected result as fair and equitable grading is an assumed tenet of the educational system, and a matter that is of great importance to both students and teachers. The top four response for both groups are fairly similar except for one major difference. Students strongly agreed with the stem, "is able to explain difficult concepts" 53.6% of the time; however, TA assistants never selected strongly agree for that stem. Interestingly 100% of TAs agreed with the stem, so there appeared to be no disagreement overall. Instead, the discrepancy is in regard to the magnitude of its importance. This result may be impacted by the small sample size of TAs surveyed, however it is worth noting the difference in emphasis by the two groups.

TAs agreed strongly with "is well prepared" and "is easy to understand" as well. It was somewhat surprising to see lower frequency for student responses, as it is counterintuitive for students to not rank the ability of a TA to communicate clearly as highly important. However, the ranking data and qualitative data are both helpful in adding context to those results. A significant portion of students (39.4%) placed "is easy to understand" in their top 3 characteristics of an effective TA (Table 4). Some of negative responses may result from a misunderstanding or misreading of the question. Although the frequency of "is well prepared" is not as high as several other characteristics, the language used in the free response portion to describe the results of lack of preparation is very strong. Students stated:

> *"If the TA is not well prepared than how can the students be, because they need to put the same effort as us"*
>
> *"They need to be prepared and know the material well enough to teach it."*
>
> *"MUST be prepared for class"*
>
> *"Being prepared. I have had TAs who just come in and throw a lecture together. Please know what you are talking about or you are wasting my time"*

Quantitative - Ranking

The ranking question was included in the survey to help provide more resolution for participants' valuation of the characteristics. The results are presented both in terms of frequency of an item being selected as the most important and the frequency of the item appearing in the top 3 (Table 4 and 5).

Table 4: Student Ranking of Characteristics

An Effective TA_____	First Choice	In Top 3
grades fairly	21.3%	38.6%
is able to explain difficult concepts	14.9%	44.2%
is well prepared	13.3%	34.9%
is easy to understand	12.9%	39.4%
is available outside of class	7.2%	21.3%
treats all students with respect	6.0%	15.3%
is an expert in the content area	6.0%	22.9%
cares about students success	4.0%	20.1%
has a sense of humor	2.0%	6.4%
is enthusiastic about the subject	2.0%	9.2%
gives prompt feedback on assignments	2.0%	17.3%
encourages students to ask questions	0.4%	6.0%

Table 5: TA Ranking of Characteristics

An Effective TA_____	First Choice	In Top 3
is well prepared	50.0%	66.7%
grades fairly	16.7%	33.3%
is enthusiastic about the subject	16.7%	50.0%
gives prompt feedback on assignments	16.7%	16.7%
is available outside of class	0.0%	16.7%
has a sense of humor	0.0%	0.0%
is easy to understand	0.0%	50.0%
treats all students with respect	0.0%	0.0%
encourages students to ask questions	0.0%	16.7%
is able to explain difficult concepts	0.0%	0.0%
cares about students success	0.0%	16.7%
is an expert in the content area	0.0%	33.3%

Unsurprisingly, grading fairness remains a top choice for both students and TAs. It is important to note that explanation of difficult concepts remains a high priority for students and is the most frequent item in the top 3. However, not a single TA placed the item in his or her top 3. Another discrepancy comes up in regards to the teacher's attitude about the content. The teaching assistants identify "is enthusiastic about the subject" as important, yet only 9.2% of students ranked this in their top 3.

Qualitative

Out of the 250 completed surveys 197 students completed the free response portion for a 78.8% response rate. A smaller group of responses was used to help determine general themes. Then all responses were coded. Many responses covered multiple themes. Table 6 presents the top 5 themes in terms of frequency of occurrence within the responses. This qualitative data provided some essential depth to the responses. Each of the top 5 themes will be discussed in more detail with illustrative quotations take from student responses as applicable.

Table 6: Top Theme Frequencies

Theme	Frequency
Ability to Explain	47.7%
Content Knowledge	38.6%
Availability	21.8%
Approachability	18.8%
Fairness	17.3%

Ability to Explain

The quantitative data clearly illustrated the importance of explanation to students. Their responses provide even more detail in this area. Students are looking for the TA to be a "bridge between teacher and student" and to provide explanations at the level of the students. This includes change in pace or delivery method or addressing a problem from multiple ways. Implicit in this is the idea that a TA has been through this material as a student recently and will be able to relate to student struggles and needs, which relates back to the dual role as stated by Spike et al[3].

> *"Effective TAs reiterate what professor teaches in class in "smaller words" and at a slower pace"*
>
> *"Knows material well enough to explain to students who have very little understanding; ability to explain at their level."*
>
> *"Can come across the problem in multiple ways."*
>
> *"Can explain material in a simpler way than the professor"*
>
> *"Explains difficult concepts in more than one way to help all understand"*
>
> *"Explain a concept in different language and method than most professors do, since TAs most of the time are young."*
>
> *"Many times, TA's teach as if the students they are teaching know the material that is being taught and therefore, say little about the topic, rush through background formulas and concepts, and quickly arrive at answers. Usually students do not know as much as the TA assumes they know and it is actually very helpful when the TA slows down, explains things thoroughly, writes legibly using equations and pictures"*
>
> *"Being able to explain the concepts to students who aren't experts in the subject."*
>
> *"They should, of course, know what they've teaching. But they should also be able to explain it in simple terms."*

Content Knowledge

Although the stem "is an expert in the content area" was not highly ranked by students the theme of content knowledge was the second most prevalent theme in the responses. The key distinction is in the level of knowledge. Students frequently referred to "knowledge of." or "understanding of…" the material and seldom used the term "expert." Some were even as explicit as to state that expertise was not a prerequisite for effectiveness.

> *"Understands the subject and can help students better understand the concepts"*
>
> *"They don't have to be the smartest just someone that knows the information and can deliver it to the students"*

"Doesn't have to be an expert but should be able to help with most student questions"

Availability

Students are interested in traditional forms of TA availability such as office hours or scheduling office appointments. However, another recurrent theme involved TA responses to emails. This is an important aspect of perceived availability to students, and something important for TAs to keep in mind.

"Someone who is readily available during core class hours and is willing to assist with questions regarding assignments. Someone who is willing and wants to help students who put in the effort"

"Availability is a big factor"

"Someone available outside of class hours to go over difficult topics"

"He or she should be able to help with homework, be able to meet at regular time weekly or be available through email. Even more importantly, being active with email to meet students' needs"

Approachability

It was very clear from the responses that students are likely to view TAs in the role of "bridge" as mentioned previously. This optimism for their ability to relate to the TA also comes with a set of expectations in the affective domain.

"It also helps if they can make the material relatable and fun. Since they've been through it already, it's also nice when they give pointer."

"A TA sometimes has more chances to meet with students compared to professors. For them to get on our level and help explain the material a little better than the professor always helps. TA's who relate to us as students and young adults makes them so much more approachable than professors."

"Explain the topics covered in class because a lot of times TAs will have more interactions with the students than the professor will"

"Somebody who can relate to an undergraduate in their personal lives as well as getting the complicated concept across effectively. Can give good advice on an academic level and a personal level"

Fair/Feedback

Students are not only concerned with fairness of the grades they receive, they are also looking for detail about those grades. At this crucial feedback point students often feel like grades without detail are "unfair."

"The TA should be respectful of students and provide feedback and explanation on grading criteria (if what types of mistakes get points deducted and by how much)"

Discussion

The results of this survey just begin to examine what is a detailed and complex issue, and further investigation and refinement of both the instrument and methods is necessary. However, several broad themes have emerged from this initial examination.

The first of these is the opportunity that TAs have to connect with students. There is a level of respect students grant to TAs because of their proximity in age and time spent as a student. There is also the perception that TAs will be able to go over the material in a manner that is more appropriately scaled or paced to students cognitive level. In order to capitalize on this opportunity, TAs must be aware of some of the potential pitfalls that can sour that rapport and connection with students. Lack of preparation, disorganization, disconnect between TA and professor, and delayed or unclear grading were all stated repeatedly by students as sources of frustration. As illustrated by quantitative rankings, enthusiasm, although important, cannot substitute for deficiencies in some of these fundamentals. Although not explicitly stated in any of the results, assessing student background knowledge is an essential component of scaling explanations and lessons appropriately for students. TAs need to be actively seeking ways to address the content from a different perspective and also tie in their own experiences or even current research whenever possible.

The importance of the affective domain was illustrated throughout the results. Students are very concerned with TAs that are not only available, but also approachable. Although not revealed as strongly by the quantitative data, the qualitative data had frequent mentions of the importance of students feeling comfortable to ask questions both in class and individual settings. The vocabulary used to describe a TA's ability to explain also illustrates the affective connection. Students used phrases like "takes the time to explain" and wants to "help the students succeed" to illustrate the importance of feeling like the TA is invested in their success.

As an initial assessment, this study leads to several clear avenues for future work. An expansion to other sub-disciplines and even disciplines within engineering could provide some interesting data and potentially elucidate more differences between groups. Expansion would also provide the opportunity to increase the TA sample size, which is essential for future endeavors. Interviews with TAs would also provide more depth of insight into their held beliefs and practices in the classroom. Finally, differences between lab and lecture courses may be better addressed by separate surveys with some overlapping questions in addition to questions that guide students to specifically reflect on the distinct roles of TAs in different contexts. Just as TAs have a great opportunity to support their students growth as learners, departments have the potential to provide the appropriate help and support necessary to allow the TA position, and the challenges and opportunities inherent within the role, to be utilized to provide essential training for their graduate students as future faculty members.

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Appendix A: Student and TA Survey

Course: _____ Day:_____

I. An Effective Teaching Assistant_____.					
1. Grades fairly	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
2. Is available outside of class	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
3. Has a sense of humor	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
4. Is well prepared	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
5. Is easy to understand	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
6. Treats all students with respect	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
7. Encourages students to ask questions	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
8. Is enthusiastic about the subject	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
9. Gives prompt feedback on assignments	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
10. Is able to explain difficult concepts	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
11. Cares about student success	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*
12. Is an expert in the content area	*Strongly Disagree*	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

II. Of the 12 characteristics above please list the 3 most important

1._____ 2._____ 3._____

III. Please describe (in detail) what makes an effective teaching assistant?

IV. Please enter the following information:

Gender

Age

Name:

What is your race?

- ☐ African American
- ☐ Hispanic
- ☐ Asian
- ☐ Native American
- ☐ Pacific Islander
- ☐ Caucasian
- ☐ Other, Please Fill in here _____