

Understanding the Motivations of Undergraduate Teaching Assistants: Making Better Teachers through Knowing Why They Teach

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Abstract

In this paper, we examine the motivations of Undergraduate Teaching Assistants (UTAs) in First Year Engineering (FYE) classes to better understand their teaching ability. By better understanding UTAs, course coordinators can make decisions that benefit UTAs allowing the UTAs to better educate their students. The success of first year students is directly related to their retention through graduation as engineering students. The data for this paper was gathered from an online survey administered to FYE UTAs, which examined their responses to questions related to Self-Determination Theory (SDT) and Possible Selves Theory (PST). The results from the examination of the UTA responses showed that their autonomy is lower than their responses to items related to competency and relatedness. Also, their possible selves were heavily focused on financial and job related futures. As a group, the surveyed UTAs also felt their position as a UTA helped them develop skills and experience that was important for their future goals.

Introduction

In many universities, the field of engineering is introduced to freshman engineering students through a FYE class or program. These programs or classes serve as an introduction to these students on topics such as ethics, the design process, and design projects. These FYE programs can also cover broad subjects such as explaining the different disciplines of engineering or even introducing students to working on a team with other engineers. As many major universities have FYE programs in their engineering colleges, it is important to study the impacts of these classes as they directly affect a large number of engineering students. One factor affecting these FYE programs are the UTAs who assist in the administration of these courses.

If the ability of UTAs to assist their FYE students were to improve, the students would be more successful in their FYE classes, thus increasing student retention through graduation. Student success in FYE courses is related to their retention within engineering¹ and is attributed to their self-efficacy beliefs. Self-efficacy beliefs are an individual's confidence in their own competence within their work.¹ As near-peer instructors, UTAs are important in encouraging FYE students to persist in an engineering discipline through the development of the student's self-efficacy beliefs. Through near-peer instruction, UTAs, peers of the FYE students, make great facilitators for FYE classes. This is due to the UTAs' recent experiences with the material

the FYE students are learning as well as the UTAs' close understanding of the hardships the students are experiencing.² It has been shown that the success of engineering students in their first year is related to stronger beliefs in their self-efficacy and their retention through graduation.¹ Therefore, one way to improve the retention of engineering students would be to improve how FYE UTAs are able to assist their FYE students. However, in order to help UTAs improve themselves, their own personal motivations must be understood. To better understand UTA motivations, this paper uses Self-Determination Theory (SDT)³ as well as Possible Selves Theory (PST)⁴ to examine motivational constructs that effect UTAs.

Theoretical Framework

This paper uses two key theories in order to analyze the responses given by the UTA. These two theories are SDT and PST. The first of these theories, SDT, argues that individuals have three needs that must be fulfilled for their motivation to be fostered and grow.

The first of these theories, SDT, argues that individuals have three needs that must be fulfilled in order to foster internal motivation.³ These three basic needs are autonomy, competency, and relatedness (i.e. decision making capabilities, feelings of knowledge for their job, and connections to others in their environment). In order for an individual to be properly self-motivated, their three needs must be satisfied. It has been shown that self-motivated individuals make good leaders who can influence the motivations and opinions of others.⁵ A leader's positive influence can encourage others internal self-motivation and promote a better self-image.⁵ In the case of UTAs leading their students, by increasing the UTAs' self-motivation and thus ability to lead, the self-motivation and self-image of the FYE students will also positively increase potentially making them better students.

The second theory, PST, focuses upon the actions of an individual in response to achievable or avoidable situations that are still to come. PST states that these possible selves can motivate an individual and cause an individual to develop in order to achieve or avoid these possible futures.⁴ The future possible selves serve to focus an individual's motivations on specific goals and can affect what an individual does in the present to impact their future. There are two possible future selves that were used to examine the UTA respondents for this paper, positive possible future selves and selves to be avoided. The positive possible future selves are futures that the UTAs want to achieve and are positive futures that they would like to be realized. The selves to be avoided are possible future selves that the UTAs do not want to become a reality and work to avoid. It has been found that a majority of respondents to possible future selves based questions find their positive future selves as very possible futures, whereas only a small portion of respondents find their selves to be avoided to be likely futures.⁴ Most respondents also have considered a very wide array of positive future selves, while only considering a small scope of the selves to be avoided.⁴ The individual's motivation stems from either working towards achieving a positive future self (a goal) or avoiding a negative future self (a threat).⁴ Based upon

this consideration, many individuals' motivations are shaped upon achieving positive goals and less individuals are motivated by their perceived threats.

These two theories are brought together in this study by combining their outlooks on an individual's motivation. While each independent theory proposes that it can alone give a proper outlook on how an individual is motivated, this study focuses on their reliance to one another. While an individual's future possible selves gives them work goals and tasks to accomplish, they still cannot be motivated to accomplish these goals without satisfying their three SDT needs. However, if an individual has their three needs satisfied, they may be motivated, but they may have nothing to be motivated for. Therefore, it is important for an individual to not only have strong possible future selves but to also have all of their motivational needs satisfied.

Methods

The results that were analyzed for this paper were drawn from UTAs' responses to an online survey. The survey was administered to UTAs from three large public universities with FYE programs. These universities were chosen due to the size and extensive use of UTAs in their FYE programs. They are also typical representations of many FYE programs with common curriculum and multiple sections. The three universities (referred to as U1, U2, and U3) had 42, 40, and 9 respondents respectively. These UTA respondents were from populations of 84 (response rate: 50%), 90 (response rate: 44%), and 14 (response rate: 64%) UTAs for their respective FYE programs. The survey was made up of 67 questions which varied in context from basic demographic questions to questions asking about the UTAs' work load, SDT, and about the UTAs' positive future selves and selves to be avoided.

The surveyed UTAs were asked a series of Likert-style questions that focused upon the three needs of SDT. Their responses were coded on a scale of 1 through 5 on how well they would agree with a statement. These responses were stored in an Excel table where they were then broken down into separate groupings. Within these Likert-style questions were several reversed scale questions for each need. These questions would embed a word such as "not" that would make the question ask for the reverse of each of the three needs (i.e., "There is not much opportunity for me to decide for myself how to go about my teaching."). These responses served as a check to ensure that the UTA respondents did not respond with the same answer every time. As these questions were the reverse of the normal questions, their response score was flipped during analysis (i.e., a score of 2 would be a score of 4 in the analysis) to be used with the other questions. In order to try and find differences between the UTAs, responses were broken down into several groupings such as: university, sex, whether they had taught this course before, and whether or not they self-describe as having teaching experience. The average response for each of the three basic needs (i.e., 9 questions were averaged together for autonomy and competence and 11 were averaged for relatedness) was generated for each grouping and compared to the set

of averages for all of the UTAs together. Below, Table 1 shows the number of respondents for the various demographics based on their university.

Table 1: UTA Demographics

| Number of Students in Each Demographic by University | | | | | |
|---|------------------------------|---------------|-------------|---|--|
| University | Number of Respondents | Female | Male | Prior Experience Teaching Inside of FYEP | Prior Experience Teaching Outside of FYEP |
| U1 | 42 | 24 | 7 | 20 | 16 |
| U2 | 40 | 14 | 19 | 17 | 20 |
| U3 | 9 | 5 | 1 | 5 | 6 |

Next, the UTAs were asked about their future possible selves. First, they were asked to list four possible future selves that they would like to one day accomplish and whether or not they are actively working towards this goal. Then they were asked to list four possible future selves that they would like to avoid and if they were currently working to avoid this goal. The PST based responses were collected and broken down into four subsections using an open coding approach. These subsections were: Job/Financial, Future Education, Personal Trait, and General Life (e.g., employed at a top company, getting my masters, happy, and settling down and raising a family). The responses were categorized based upon their emphasis and sorted into a series of tables depending on when the UTA listed it as a possible future self. This information is presented in the Results section of this paper.

Finally, the UTAs were asked four questions to gauge the relationship between their current UTA position and their future job goals. These questions asked if the UTA position was relevant for their ideal job, had prepared the UTAs for this job, and had given them the tools needed for this job. A fourth question asked if the UTAs felt their position was unrelated to their ideal job to check for consistency in responses. These questions, like the SDT questions, were answered using a Likert-style scale, and the responses were averaged to gain a general understanding of the relationship between their current positions and their future careers. The fourth question was reverse coded for this average.

Results

Upon initial observation of the data from the Likert-style SDT based questions, it appeared that there were significant differences in the autonomy scores for the UTAs who had taught the class before in comparison to those who had not. As the data was tested and proven to be normal using a Shapiro-Wilk test, a t-test was applied to this data to confirm this belief. However, it was shown to not be significant difference. This was also done for the male and female UTAs, but again no significant difference was found. Because no significant differences could be found between the generated sub-sections of UTAs, it was concluded that the various descriptive

factors such as sex, teaching experience, and university had little affect over the UTAs' perspective towards being a UTA as related to the studied motivation constructs.

While no differences were shown between the same needs, through the different groups of UTAs described above, there was a difference between the UTAs' rankings of the various needs. As a whole, the UTAs ranked both competency and relativeness above a 4 (i.e., somewhat agree); average competency being a 4.1 and average relativeness being a 4.35. Autonomy, however, was scored lower than the other two needs with an average response of 3.09 (i.e., neutral). Two separate t-tests were run to see if this difference was statistically significant. It was shown that compared to both the relativeness and competency, the autonomy was statistically significantly different than the other two sections ($p < 0.05$).

In addition to the Likert-style questions, the participants were also asked about their possible future selves. The number of responses within each category was counted and put into the table which is provided as Table 2 for the positive future possible selves and Table 3 for the selves to be avoided.

Table 2: Number of Positive Future Possible Selves

| Positive Future Possible Selves | | | | |
|--|----------------------|-------------------------|-----------------------|---------------------|
| Response | Job/Financial | Future Education | Personal Trait | General Life |
| Response 1 | 46 | 13 | 3 | 2 |
| Response 2 | 32 | 7 | 3 | 18 |
| Response 3 | 21 | 6 | 5 | 24 |
| Response 4 | 11 | 6 | 1 | 25 |
| Response 5 | 7 | 4 | 5 | 18 |

Table 3: Number of Selves to be Avoided

| Selves to be Avoided | | | | |
|-----------------------------|----------------------|-------------------------|-----------------------|---------------------|
| Tier | Job/Financial | Future Education | Personal Trait | General Life |
| Response 1 | 31 | 2 | 10 | 14 |
| Response 2 | 24 | 2 | 9 | 17 |
| Response 3 | 9 | 2 | 9 | 19 |
| Response 4 | 10 | 2 | 6 | 15 |
| Response 5 | 10 | 1 | 6 | 11 |

The UTA respondents were also asked whether or not they were currently doing anything to achieve or avoid these futures. Table 4 provides the sums of UTAs who responded yes or no to

whether or not they were working towards their positive possible future selves. Table 5 provides the number of respondents responding yes or no for the selves to be avoided.

Table 4: Responses Related to Working towards Possible Future Selves

| Positive Future Possible Selves: Are you actively working towards achieving this goal? | | |
|---|-----|----|
| Response | Yes | No |
| 1 | 53 | 5 |
| 2 | 30 | 25 |
| 3 | 25 | 25 |
| 4 | 18 | 22 |
| 5 | 18 | 12 |

Table 5: Responses Related to Working towards Selves to be Avoided

| Selves to be avoided: Are you actively working to avoid this future? | | |
|---|-----|----|
| Response | Yes | No |
| 1 | 39 | 14 |
| 2 | 28 | 20 |
| 3 | 19 | 17 |
| 4 | 18 | 13 |
| 5 | 12 | 13 |

For both types of possible future selves, the number of UTAs who responded to subsequent PST questions was always less than the number of UTAs who responded before. It was determined these non-respondents could not be considered responding as no, as they may simply have not listed a corresponding future self in the prior questions or their response may have been yes but instead they skipped the question. However, from the responses that were given there are more individuals working towards their first listed goal than their last listed goal. The number of UTAs responding that they were not working towards a goal increased the later the goal was listed. Eventually, there were at times as many students not working towards their later goals as there were working towards these goals. In fact for both positive future selves and selves to be avoided, for later possible selves there were more no responses than yes responses (response 4 for positive and response 5 for negative). Due to the higher amount of UTAs who were actively working for or to avoid their first listed goals, it was concluded that the goals that were listed first could be more important to the respondents or weighed more heavily on their minds.

Towards the end of the survey, immediately following the PST questions, the UTAs were asked four questions to gauge the relationship between their current UTA position and their future job goals. The overall response was a 3.7 which would be between neutral and somewhat agree.

This response showed a slightly positive feeling of UTAs toward the relationships of their teaching position and their future plans.

Discussion

Due to the importance seen in the PST theory questions that the UTAs placed upon their Job/Financial futures and the overall positive outlook upon their UTA position as a vehicle to reach these ideal futures, it is believed that many of the UTAs take and hold these teaching positions in order to create a better path to their ideal job/financial futures. As holding these positions is integrated into accomplishing future goals, these positions create a positive impact on the UTAs' motivations in the current moment, or as PST states, the "now-self".⁴ This is important because achieving progress towards a future goal will make all positive future selves seem more attainable.⁴ An example used in *Possible Selves*, a defining paper on PST by Markus and Nurius⁴, is that: "a student who just passed qualifying exams for their future profession views themselves as not just a student who has passed these exams, but a student who could go on to earn a doctorate, be paid highly for their dream job, or make groundbreaking research." In this way, achieving possible future selves' goals defines self-image. Therefore, the UTA position fulfills a need that the UTAs have, allowing them to springboard into their future jobs. By fulfilling this need, the UTA position creates a positive self-image for the UTAs to build themselves around within the teaching position. A positive future self is an incentive that an individual, in this case a UTA, continues to work for. However, if the individual does not work towards this incentive or progress is not made positively towards this goal, it can create a negative impact upon the individual.⁴

If engineering students are drawn to becoming UTAs due to their future aspirations, in what ways does this position help them fulfill these goals? While in future studies the UTAs themselves could be asked this question, we have hypothesized some possible reasons. Some of the possible reasons UTAs feel that their position aid their future job or financial goals could be that it shows their ability to lead and teach others, specifically other engineers. Additionally, it may give them sources for engineering networking, as well as engineering role models to emulate (i.e., more experienced UTAs or faculty). Yet the UTAs can garner no benefits from their position if this position does not fulfill their intrinsic motivational needs. These needs derive from SDT.

Within their position, the UTAs must satisfy the three intrinsic needs described within SDT. If these three needs are properly met, it creates an environment which allows the UTAs to become properly motivated and improve within their position.³ This motivation allows the UTAs to work towards their future possible selves and achieve their goals through the use of their UTA position. Also by fulfilling these goals, course coordinators are ensuring that the UTAs they use within their courses continue to strive to do their job to the best of their ability. In this way, a UTA with their needs properly fulfilled can accomplish the tasks set for them easier and better

facilitate the education of their students. However, if these needs are not properly fulfilled, the UTAs will lack the motivation within their job to put in the extra effort for their students. They will also not be properly motivated to use their UTA position as a springboard for their future. This negative motivation can compound onto a negative self-image, as if the UTAs believe they are not making noticeable progress towards their future possible selves. This will create a negative self-outlook for the UTAs.⁴

A major consequence of UTAs creating negative self-images, and failing to motivate themselves, is that this will directly affect their students.⁶ Students who are led by UTAs with a negative self-image, or little to no inner motivation, may not develop the needed positive traits themselves. Therefore, it is important to encourage the positive self-image and motivation of the UTAs for FYE classes. For the most part, among the UTAs that were surveyed all of their needs were being properly met. The one point of concern would be that the autonomy ranking as compared to the other two sections of SDT was significantly lower. While it was still at an acceptable rank (i.e., 3 equates to neutral opposed to a negative perspective), this means that some UTAs were rating it as below average and thus this need was not being fulfilled. Despite this circumstance, it was expected that the autonomy of a UTA would be lower for varying reasons. Some reasons that were believed to be affecting these scores were: the students themselves recently took the course, thus boosting their feelings of competency for the course; they are directly interacting with their peers and some former classmates, thus boosting relativeness; and they are restricted to working not only underneath a professor and potentially a GTA but also within the constrictions of the course itself, thus lowering their feelings of autonomy. Because of this, and the fact that this trend of lower autonomy was not just an overall trend but experienced in every grouping of the UTAs by sex, university, experience, etc., it appears that having less autonomy than relativeness and competency is simply a part of being a UTA in a FYE course. While we like to think high autonomy scores equal a better teaching experience, this may not be the case given that these are new teachers who are also students themselves. Future work is needed to truly understand the impact the lower autonomy ratings have on UTAs.

Conclusion

In order for a UTA to be able to achieve their future goals and effectively support their students, they must be properly motivated. They can become properly motivated towards these goals by fulfilling their SDT needs. These three needs of autonomy, competency, and relativeness were shown to have been met within the FYE courses for the UTAs. However, the average rating of autonomy being fulfilled was significantly lower than the other two needs. Despite this finding, the needs of the UTAs were generally satisfied. This supports that with proper motivation UTAs have the potential to be good role models for their students; thus, potentially affecting their students' views and retention in engineering. Further research is needed to truly measure the

impact of UTAs' attitudes on students' success, however, we believe this study supports such future work.

In order to encourage the development of self-motivation and a positive self-image within the students of FYE courses, it is important to first develop these traits within the UTAs that teach them. By understanding the motivations of the UTAs assisting FYE courses, one can assist their motivational development allowing this development to carry over to the students in their courses. Since motivational development is important to early engineering courses, we believe focusing efforts on UTAs' motivation will ultimately lead to more successful engineering students.

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