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## **AC 2011-639: GRADUATE TEACHING ASSISTANTS' DECISION MAKING AND PERCEPTIONS OF AUTONOMY**

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# Graduate Teaching Assistants' Decision Making and Perceptions of Autonomy

## Abstract

Graduate students are increasingly being called upon to teach engineering courses, yet little is known about their experiences. Based in self-determination theory, the purposes of this study were to investigate how autonomous graduate teaching assistants (GTAs) feel in their teaching duties and how graduate teaching assistants' descriptions of their teaching decisions relate to their perceptions of autonomy. Six doctoral students from five departments at a large, land-grant research university were recruited to participate in interviews about their teaching experiences. From these interviews, we found that five of the six GTAs described relationships with supervising faculty where the GTAs felt limited or discouraged in their autonomy for making teaching decisions. Our results also show that despite a perceived lack of autonomy, some GTAs continue to act autonomously when faced with decision-making in the classroom. These results can help inform faculty as they seek to support GTAs in the GTAs' teaching responsibilities.

## Introduction

For many years, graduate students have served as laboratory assistants and graders for undergraduate engineering courses. Due to recent efforts to increase hands-on activities in engineering education, many institutions are now also employing graduate teaching assistants (GTAs) as course instructors and lecturers<sup>1-3</sup>. While researchers have studied GTAs in the humanities and physical sciences, little is known about GTA experiences in engineering. The purpose of this study is to investigate the experiences of GTAs in engineering by exploring how GTAs' feelings of autonomy relate to the types of teaching decisions they make. Teaching experiences in graduate school may influence graduate students' career paths, so exploring motivation and decision making can allow universities to better support graduate students.

This study aimed to answer the following research questions:

1. How autonomous do graduate teaching assistants feel in their teaching duties?
2. How do graduate teaching assistants' descriptions of their teaching decisions relate to their perceptions of autonomy?

## Background and Situation in the Literature

The employment of graduate teaching assistants, or GTAs, has been largely motivated by the desire to allow faculty more time to conduct research, and secondarily to provide funding and teaching experience for graduate students<sup>4</sup>. At many institutions the employment of GTAs has been justified for cost saving reasons<sup>5</sup>. GTAs often are new to the university, have little training, and can have conflicting identities as teachers and students<sup>6</sup>. Therefore, the graduate teaching experience can be difficult for graduate students as they seek to find their place in academia.

GTA experiences can also significantly impact students' experiences especially in terms of classroom climate. For example, a large, quantitative study exploring retention and attrition rates in the sciences focused on the research question: "what influence do TAs have on underclass students' plans to major in or leave the sciences?"<sup>5</sup>. Study results showed that although GTAs could not be directly tied to retention they had a large amount of control over classroom climate, which in turn did impact retention rates. Moreover, students cited GTA enthusiasm and attitude as facilitating the students' learning. Given the similarity of retention and attrition issues across Science, Technology, Engineering and Math (STEM) fields, findings from this study in science are very likely to be relevant to engineering.

### *Graduate Teaching Assistants in Engineering*

According to the National Academy of Engineering: "the essence of engineering – the iterative process of designing, predicting performance, building, and testing – should be taught from the earliest stages of the curriculum, including the first year"<sup>7</sup>. Many programs are also seeking to answer this call by integrating more hands-on activities and active learning in lower-division courses, which require more facilitation than the traditional large lectures. This sharply increases the need for teaching resources compared to traditional, large-lecture format courses. Because of time and budget constraints, more and more engineering graduate students are assuming teaching responsibilities, especially in introductory courses.

In 2007, the last year for which data are available, more than 70,000 full-time graduate students in science and engineering reported receiving their current primary support from teaching assistantships according to National Science Foundation estimates<sup>8</sup>. This accounted for approximately 21 percent of full-time students. From 2001 through 2007, the number of graduate teaching assistants increased by 12.4 percent, from an estimated 63,554 in 2001 to 71,459 in 2007. Many graduate students hold teaching assistantships early in their graduate careers before transitioning to research assistantships, so it is likely that many more than 21 percent of graduate students hold teaching assistantships at some point before graduation. It is not known what types of duties these GTAs had.

Additionally, graduate student teaching responsibilities are shifting from roles as graders towards primary instructor. While bodies of research focus on faculty, pre-service and pre-K through 12<sup>th</sup> grade instructors, the body of research on GTAs, and particularly GTAs in engineering, is just emerging. Much of the current literature on GTAs in engineering tends to focus on logistics and course structures, not the GTAs themselves<sup>2,9</sup>. Since the literature does show that teaching beliefs of faculty and teachers impacts teaching experiences and practices and since large numbers of GTAs are employed in teaching engineering students, it is important to better understand the responsibilities and experiences of GTAs. This research focuses on GTAs perspectives particularly with regard to feelings of autonomy, i.e., control over teaching decisions, and how those feelings are actually enacted in teaching.

## **Teacher Autonomy**

Autonomy is directly related to motivation<sup>10,11</sup>. Autonomy is when a person's "actions are freely chosen and experienced as emanating from oneself"<sup>12</sup>. While research on autonomy in education originally focuses on students, more recent research has shown the importance of teachers' sense of autonomy. Pelletier et al.<sup>13</sup> found that teachers' perceptions of constraints in the teaching environment as well as of their students' self-determination influenced the teachers' self-determination, which finally lead to whether or not the teachers supported their students' autonomy. Pressure from the administration or from students decreased teachers' motivation. Using the same instrument as well as surveying the students, Roth et al. found that more autonomy lead to greater feelings of personal accomplishment, less exhaustion, increased student reports of autonomy supportive teaching, and increased student autonomy for learning<sup>14</sup>. Again using Pelletier's instrument, with others, Leroy et al. found that teachers with more self-efficacy, more experience in the classroom, and less external pressure provided more autonomy support to their students<sup>15</sup>. Deci and Ryan<sup>10</sup> reported that teachers who perceived a lack of interest and low levels of self-determination in their students responding by behaving in a more controlling manner. The same result was seen in the relationship between managers and employees in the workplace.

Institutions can provide support for teachers' beliefs by supporting autonomy, encouraging intrinsic motivation, and providing curricular support. Research involving K-12 teachers has found that an increase in teacher autonomy is correlated with increases in empowerment and professionalism, as well as a decrease in work-related stress<sup>16</sup>. University professors who are authentic when teaching, in that their pedagogies and beliefs are in agreement, are better able to connect to their students and help the students develop authentic knowledge and skills<sup>17</sup>. University departments can support their faculty by encouraging autonomy, creating a culture that values teaching, and providing meaningful justifications when making requests of faculty<sup>12</sup>.

Based on this literature, we expect autonomy to be important for GTAs as well, and for more autonomous GTAs to be better able to meet the needs of their students. We also expect GTAs' teaching supervisors to influence GTAs' feelings of autonomy.

## **Theoretical Framework**

Because of the posited relationship between autonomy and motivated actions, i.e., teaching decisions in the classroom, we have grounded our research in self-determination theory (SDT). This prominent theory of motivation suggests that people are motivated through a desire to satisfy three basic psychological needs: autonomy, competence, and relatedness<sup>11</sup>. Previous research shows that fulfillment of basic needs in teachers allows teachers to better support the needs of their students, and can promote greater teacher persistence and effort among students<sup>12,13,18</sup>. While much of the work on self-determination theory in education has focused on the student perspective and quantitative measures, this research will qualitatively investigate the need fulfillment of GTAs, specifically focusing on the need for autonomy.

Although we collected data on GTAs' beliefs about competence and relatedness, this paper focuses on the critical outcomes related to autonomy. Autonomy refers to a person's need to feel in control of one's actions and choices. In this study, we are concerned with GTAs' autonomy in teaching tasks.

## **Methods**

Because little is known about GTAs' teaching experiences, this research is exploratory in nature. Moreover, qualitative research methods are most appropriate for answering our research questions as we seek to understand GTAs' experience in their own words<sup>19</sup>. Although there are a variety of quantitative instruments for studying SDT none are directly applicable in this situation and using qualitative methods could help us develop appropriate quantitative methods for future use.

### *Participants*

Participants were selected from graduate teaching assistants in the College of Engineering at a large, research intensive, land-grant university in a Mid-Atlantic state. Only graduate students with significant instructional responsibilities, such as responsibility for teaching a lab, workshop, or lecture for an entire semester, were included in the study. Participants with grading-only assignments or intermittent teaching duties were not included. Participants were recruited through word-of-mouth. Teaching background, program of study, and current teaching assignment of volunteers were considered to provide a diverse sample.

All of the participants were doctoral students. Participants were pursuing degrees in Aerospace Engineering, Civil Engineering, Computer Science, Industrial and System Engineering, and Mechanical Engineering. Three of the participants taught in the general engineering program, while the other three taught in their home departments. In this setting, all undergraduate engineering students enter a general engineering, or first-year engineering program, before transferring to a specific engineering major typically in the second year. All were American students and identified themselves as Caucasian or White, with the exception of Saul who was a Middle-Eastern international student. Fred was the only participant not considering a career in academia at all, although several others are undecided between positions in academia or industry. Saul co-taught with his dissertation advisor, but the other participants had little to no contact with their teaching advisors before the semester and anticipated little to no future contact with them beyond the teaching assignment. Participants' pseudonyms, semesters of experience, and teaching assignment are shown in Table 1 below.

Table 1: Participants' Experience Level and Teaching Assignments

Participant	Semesters of Experience	Teaching Assignment
Fred	One	One junior lab
Leah	Two	Co-teaching (50% responsibility) a freshman lecture in general engineering as well as one freshman workshop
Mary	Three	Junior-level lecture, in coordination with a faculty member teaching the other section.
Nate	Three	Freshman workshops in general engineering
Sam	Three	Freshman workshops in general engineering
Saul	Eight	Co-teaching (50% responsibility) a junior-level lecture

### *Interview Protocol*

The semi-structured interview protocol was developed based on existing quantitative self-determination instruments as well as a portion of the “Studies of Engineering Educator Decisions” interview protocol developed by the Center for the Advancement of Engineering Education developed by <sup>20-23</sup>. The existing quantitative instruments were based on Likert-scale answers, and were modified to allow participants to provide detailed explanations in their own words. Additional questions were added to address the research questions. Participants were first asked about their duties as GTAs and relationships with their teaching supervisors, followed by questions about their motivations for teaching, their pedagogies, and their students. Sample questions included:

- How much of the course material did you develop, compared to being given to you by your supervisor?
- Have you made changes to the course material? Why or why not?
- Has your supervisor encouraged you to adapt the material or emphasized consistency?
- Why have you chosen to be a GTA for (specific course)?
- How do you choose what kinds of learning activities to do?
- How do students respond to various class activities (lecture, work a problem individually, work in groups)?

Finally, participants were asked to describe a situation when they had to make a decision during a class session. This section of the interview was adapted from a protocol for exploring decision making in engineering faculty developed by the Center for the Advancement of Engineering Education <sup>22, 23</sup>. Participants were prompted to provide a rich description of their decision-making processes using the following questions:

- Can you please describe a recent in-class situation in which you were faced with decision making?
- What types of alternative decisions went through your mind when you were in this situation?
- Can you tell me about the important factors that you have considered in making this decision?
- Can you talk about the outcomes of this decision?

The semi-structured format allowed the interviewer the freedom to probe the participants for more detail or explore relevant areas not addressed by the interview questions. Each interview lasted for 20 to 45 minutes, and participants were offered a ten dollar gift card to the campus bookstore to compensate for their time. Interviews were recorded and transcribed verbatim. We then conducted a variable centered analysis as described by Miles and Huberman<sup>24</sup>, in which we organized participant responses across a spectrum of both perceived autonomy and autonomy in practice.

## Results

To answer our research questions we look first at GTAs' perceptions of autonomy, i.e., whether or not they feel a sense of control over their teaching. We then looked at how autonomy was enacted in the classroom in terms of the teaching decisions that the GTA's describe.

### *Perceptions of Autonomy*

In examining perceptions of autonomy, the most salient interview questions were "Have you made changes to the course material? Why or why not?" and "Has your supervisor encouraged you to adapt the material or emphasized consistency?" Most participants reported low perceptions of autonomy, i.e., little control over teaching choices. As described in the following section, Saul is an exception.

Fred, teaching a junior lab, reported that the course material "was all just given to me" and he didn't make any changes because "junior lab has sort of been developed by faculty throughout the years ... so I figured they knew what they were doing; they had their system in place". He also reported an emphasis on consistency between different sections of the course from the lab coordinator. Fred does not wish to make any changes, since "if you deviated that means that your students are getting special treatment, either for good or bad, so you try to stick with everybody else". Fred is concerned that changes could advantage or disadvantage his students over others which would not be in line with having consistency among sections.

GTAs in the freshman program reported slightly more autonomy than Fred and interpretations of the same interactions with teaching advisors have differing GTA interpretations. Lecture and workshop course coordinators provide PowerPoint slides for all GTAs and instructors each week, and then lead weekly meetings to go over the slides and associated activities. Nate describes that the course coordinators communicate to the GTAs "that within some bounds we have a lot of freedom", but that "I'm not sure that I'd be free to change [course materials] very much because it has to reflect their decisions." In GTA meetings, "the overall theme of their answers [to GTA questions about making changes] has been 'you can feel free to personalize, but we have to maintain consistency'. It's always been that kind of emphasis on consistency". However, Sam seems to have different perceptions of the same interactions. He reports that the course coordinators "definitely encourage, you know, change up, change things a little bit if you think it's necessary", though he still only says "I'll kind of edit the PowerPoint and then teach something a little different style". Sam seems to focus on the little bit of freedom the GTAs have to make small changes, while Nate sees the broader limitations on what he cannot change in the course.

In co-teaching a freshman lecture, Leah works with a professor as well as the course coordinators. Both Leah and her professor attend all lecture meetings. In her relationship with the professor, Leah expresses more autonomy than the other freshman GTAs. Leah reports “I kind of rearranged how I would do the class, I guess, and not just doing it in the way that other people told me to”, and provides multiple instances of where she added examples to the lecture slides. However, she adds the condition “I haven’t added a lot.” She also provides examples of how the professor has adjusted the slides and added information, encouraging Leah to do the same. But while Leah feels confident enough to add material, she does not feel comfortable removing any information. This even includes general announcements that she sees deliverable through other means such as posting to a course website.

Mary, despite having her own section of a junior level course, also reports “more emphasis in consistency” with a teaching supervisor who teaches another section of the same course. The supervising professor developed the course materials that Mary is using, and the two sections share a syllabus and course website. During meetings about the course Mary believed she made some suggestions but that they were not often accepted for implementation. Mary has made minor changes to the lecture, “added in a few, one or two things maybe throughout... like adding in a slide or two or an example”, and to the exams. Her supervisor “provided the old exams and I kind of added some new questions and rewrote some of the old questions”. Still, Mary reports not making many changes because “I don’t know, I just didn’t feel that I could, I guess”. At the surface, Mary has a high potential for autonomy because she is teaching her own section of a course. In practice, though, she reports very low feelings of autonomy. She’s also worried about her future, “because next semester I’ll have my own class, I don’t know if I’ve had enough to really, know how to like, develop materials and do all that stuff, so maybe a little less support in this case? I like the support, and I wouldn’t turn it down, but maybe a little more opportunity to develop some course materials would be good.” A lack of autonomy this semester has her questioning her competence for tasks she will need to perform next semester.

Finally, Saul reports a great deal of autonomy. He is co-teaching a junior lecture with his research advisor. Saul teaches two units, and his professor rarely attends when Saul teaches. He is the only participant to have a prior relationship with his teaching supervisor as well as the only one to anticipate a future relationship. This standing relationship may have increased Saul’s feelings of relatedness, in turn increasing his autonomy. Saul reports that “[my advisor is] like my mentor and he’s like my role model as a teacher... and it’s really a good experience working with [my advisor]”. While his mentor has developed course materials over several years, “we modified a little bit according to, my taste of, you know teaching ... I just contributed just like ten percent to it”. In the beginning, “[my advisor] gave me some freedom of changing everything, and I started to change everything and it was a little too much”, so Saul and the professor worked together to find a balance. In all, Saul feels that the amount of support he gets from his advisor is “right. It’s perfectly right”, and Saul is empowered to make his own changes, write exams, and develop projects for the students that meet the goals of the class.

In summary, most participants report relatively low feelings of autonomy with Saul as an exception. Knowing that beliefs can impact practices, to understand GTA teaching experiences we also need to look at how perceived levels of autonomy translate to teaching actions.

### *Autonomy in Decision Making*

Participants were asked to describe “a decision you have made about your teaching while conducting a class session”, with optional prompts for situations such as altering an activity at the spur of the moment, student requests to change course policy, or dealing with malfunctioning equipment. Surprisingly, despite little autonomy described in their perceptions of their supervisors, participant descriptions indicated a broad range of autonomy in practice.

*Very Low Autonomy in Practice-* When a piece of equipment suddenly broke in Fred’s lab, he consulted with “the head TA, the technician that helps run the lab and Dr [Name] [who] were all in the lab at the same time”. It was then determined that the students would have to come back, “they had to write a lab report on that [experiment]... That’s really the only option I saw at the time”. When asked who made the decision to have the students come back, Fred explained “I think it was just the obvious decision. So, it was sort of the only decision”. A key factor in autonomous decision making is the reasonable consideration of alternatives <sup>11</sup>. Fred did not consider alternatives, and did not display flexibility in dealing with unexpected circumstances.

When Mary was asked to describe a situation where she made a decision in the classroom, she described a situation where her students asked her to move an exam. She responded “I can’t change that, that’s what been set since the syllabus was, um, issued. And then, since I had to consider the other section as well, I couldn’t make a change of exam when there was another section to consider”. She then consulted her supervisor, who decided “we needed more time to cover one of the modules ... we realized that we had some extra time built in to the end of the semester in case something like that happened, so we knew that we wouldn’t get pushed too far off schedule.” With his approval, Mary moved the exam. Hearing the needs of her students, Mary made a teaching choice to consult her advisor about moving the exam. Although the outcome helped the students, Mary’s action in itself was not highly autonomous and was perhaps restricted by the structure of the course and need for consistency.

*Some Autonomy in Practice-* In contrast, Sam acted more autonomously. His students were supposed to work in groups, but many of the groups had broken equipment. Sam was uncertain of how to approach the class, because he was supposed to grade students on whether they successfully completed the class activity. “It was tough for me to be like ‘yeah, ok ok, if it’s not working, don’t worry about it’ because I didn’t want them, I didn’t want to let them know that I wasn’t, demanding that you, get it right because I didn’t want them to just give up”. In the end, Sam did his best to help the students “get something out of it” and was lenient in the grading. Sam acted with some autonomy because he was able to adjust the grades based on his own judgment instead of consulting his supervisor, and thus be flexible enough to meet the needs of his students.

Similarly, Leah described a situation where a particular data collection activity was likely to result in her students “getting lost on the internet looking for the information” and take a lot of time. Leah instead chose to walk her students through that step, which “wasn’t a very big deal, but, I mean, it kind of made things flow better for me, actually”. In the end, “more students were able to finish more quickly”. Leah exhibited enough autonomy to make a minor adjustment to better achieve the goal for her students.

*Highly Autonomous in Practice-* Nate's example of a teaching decision occurred on one of the dates of a common exam, and Nate's late-afternoon workshop was scheduled to end one hour before the exam was to begin. When the students arrived in class, he noticed they would "Sit there, actually, staring at me, and don't really participate and are very difficult to engage". Nate realized the students were concerned about the test, and therefore not interested in the new material he was presenting. Nate considered that the workshop materials "have gradable output" and that homework associated with the workshop was not due soon, so he decided to post the workshop slides online and have the students review the material on their own time. Continuing with the scheduled materials "just didn't seem like a great opportunity for them to learn". He told the students they could leave if they needed to, and spent the rest of the workshop time answering student questions about the exam material. The students "were much more engaged ...and they were helping each other kind of study". Because of his strong sense of autonomy, Nate was aware of his students' needs and willing to change to meet their needs.

After assigning the first project Saul realized that the students may not be able to accomplish all that he asked of them. "I realized that a lot of them, a lot of them are really lost and I needed to change the assignment a little bit and change the project after I assigned it to the students". After reflecting on the goals for the project, Saul was able to simplify the requirements and provide a help session. "I gave them some hints and I, dropped some very tough parts of the project". In the end, the students "did learn a lot about [the topic] from the first project ... They really responded well." Because of his autonomy as a teacher, Saul was able to be very flexible and better meet the needs of the students while still accomplishing the goals of the course.

## **Discussion**

Our results show that five of the six GTAs described relationships with supervising faculty where the GTAs felt limited or discouraged in their autonomy for making teaching decisions. This is similar to findings that show that K-12 teachers in similar low-autonomy situations are more likely to become frustrated by the limitations on their teaching, which can result in high turnover<sup>11, 25-27</sup>. GTA contracts are often for a single semester, so it would be reasonable for a GTA with a less than ideal experience to seek a different position in subsequent semesters. In contrast, Saul's autonomy was encouraged and unlike the other participants he expressed enthusiasm as he described his plans for how he would teach the same course in the upcoming semesters. Further study is needed to directly relate feelings of autonomy with GTA persistence, but this current research provides some evidence that GTAs with more autonomy are more eager to persist in teaching.

Our results also show that despite a perceived lack of autonomy, some GTAs continue to act with autonomy. Moreover, we find that GTAs who act with more autonomy are better able to adapt to meet the needs of their students. This finding is consistent with research has shown that teachers with more self-determination are better able to support their students' needs<sup>14, 15</sup>. Usually GTAs have more contact with their students than the teaching mentors or course coordinators do, and may be in a better position to assess and address immediate needs. Fred, Nate, and Sam all taught workshop sections that were much smaller than the associated lectures for their courses. In addition, all three usually received instructions or advice with workshop or

laboratory coordinators that were different from the lecturers. Mary's supervisor did not attend her class. Leah's supervisor did attend all of the lectures, but Leah spent an additional two hours a week with half of her lecture students in a workshop setting. Saul's teaching advisor did teach half of the lectures, but rarely attended when Saul taught. So when the time came to make critical decisions, Fred and Mary's lack of autonomy meant had they to turn to professors that did not know their students in the same ways that they did. In contrast, Nate and Saul were able to autonomously consider the needs of their students based on multiple interactions and experiences with them.

This research provides valuable insight into the experiences of GTAs in undergraduate engineering courses and how faculty and administrators can better support GTAs. Faculty working with GTAs need to know that faculty actions can support or discourage GTA autonomy. In helping GTAs prepare to teach, faculty should support GTA autonomy by providing sufficient resources and guidance but giving the GTAs room to make their own decisions. GTAs appreciate support from faculty and having some materials provided. However, GTAs that perceive too much of an emphasis on consistency or a lack of input on how the course is taught can become frustrated. This perceived lack of autonomy then influences how well GTAs can adapt in challenging situations to meet the needs of their students. Also, as seen in the case of Mary, a GTA that is not given the freedom to participate in course planning and development may feel unprepared for future teaching responsibilities. By improving support for GTAs, it is expected that GTAs will be empowered to better meet the needs of their students and have more motivation to continue teaching.

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