

TEACHING ASSISTANTS ON THE FRONT LINES:  
A STUDY OF A COMPUTER SCIENCE DEPARTMENT'S PROGRAM

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## Abstract

The Undergraduate Teaching Assistant (UGTA's) Program within The University of Arizona's Computer Science Department has been wildly successful over the past half decade. With more than 1200 undergraduate students, class sizes, especially at the introductory level, can be quite large. UGTAs are a crucial resource to both students and professors in these larger courses. However, the program faces challenges and has the potential to grow - most notably in its need for training the UGTAs when they are first hired and the need for more flexibility within the job. Improvements aimed at addressing these areas have been developed and launched in the past year. These improvements include a two day training program that newly hired UGTA would be required to participate in as well as a new position for experienced UGTAs to demonstrate growth and experience - both of which were launched in the Spring 2023 semester.

## 1. Introduction

The Computer Science department is one of the largest departments in the College of Science within The University of Arizona (UARizona). There are almost 1200 undergraduate students in the department, of which almost 700 are in the pre-major and almost 500 are declared in the major<sup>1</sup>. This means that class sizes - especially in the pre-major courses - can be particularly large, with almost 500 students in one class. The large class sizes provide an interesting dilemma for professors and lecturers, who need to ensure that students are gaining proper access to the information that will set them up for future classes. In addition, certain courses, such as CSC120 or CSC245 (CSC 144/244) are known to be notoriously difficult, and while these courses are considered fundamental by experienced students, students that are

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<sup>1</sup> Numbers as of Spring 2023

currently enrolled believe them to be a “weed-out” class. It is easy to create a disconnect between different groups, which can result in a lack of support for students and discourage prospective students from pursuing computer science.

To address this, the department has a program in place to bridge any gaps that exist: The Undergraduate Teaching Assistant Program. Undergraduate Teaching Assistants (UGTAs) are undergraduate students assigned to a specific class, who successfully completed the course and who want to help current students be successful. UGTAs work, usually in teams, with the professor on providing the best education possible to students. They are compensated in either pay or credit-hours for their work and are fairly involved in the course they are assigned to. Normal tasks for UGTAs include attending lectures, holding office hours, and grading assignments. Therefore, UGTAs are heavily involved in a given course.

Because of the role that UGTAs play in the different courses throughout the department, the impact they have is larger than it may seem on the surface. Professors rely on the UGTAs for feedback both in the progress of a course semester-to-semester and for providing feedback to students on their course progression. UGTAs involved in their particular classes could have significant impact on the course structure and experienced UGTAs often had insightful input about classes. UGTAs who are active in their courses, performed well, and stayed in the program are often considered top performing students and role models within the department. As a whole, UGTAs and the UGTA program is considered a characteristic pillar of the department.

However, despite their importance in classes, there still exists many challenges and areas for growth in the UGTA program. There are very few opportunities for advancement, the time commitment can sometimes be burdensome, and in general UGTAs are given minimal guidance when they start. That was the focus of this capstone project: to identify weak points in the

existing program, and find ways to solve them. Throughout the 20 week course, several areas of growth were identified via interviews of faculty members and surveys of current and former UGTAs. Through collaboration of the department and current existing UGTAs, these areas of growth were addressed.

## 2. History

The department was founded in 1971, and for the last 50 years, has steadily grown to be one of the largest departments in the College of Science. However, when it was first established, the only degrees offered were at the graduate level. It was not till the Fall of 1989 that an undergraduate degree was offered. Because the original program was not designed for undergraduate students, a need was created to develop a curriculum and program to support the new wave of incoming students.

### 2.1 The Section Leader Program

In 1996, 7 years after the start of the undergraduate program, the department hired Stuart Reges (M.S.) from Stanford University as a Senior Lecturer. Professor Reges was hired by the University to redesign the introductory courses and implement an undergraduate teaching assistant program. While working at Stanford, he had set up an undergraduate teaching support system and redesigned the undergraduate courses, so his experience was welcomed by the department. In addition to some restructuring of the introductory courses, Professor Reges replicated the Undergraduate Teaching Assistant Program he started at Stanford. The original program at Stanford was inspired from a University-wide, student-led initiative called The Bridge which focused on peer support. After leaving Stanford and starting at UArizona, he set up an almost identical program - the largest change being that the Section Leaders had the ability to get paid in their first semester, instead of being required to earn credit initially, which acted as an incentive for new Section Leaders. In the first semester, only 1 class utilized the section leaders, then through the course of the next 3 semesters, more professors started adopting the Section Leaders for their own courses. Within 2 years, the program was running at full capacity.

In 2004, Dr. Lester McCann was hired to replace Professor Reges. When Dr. McCann inherited the Section Leader Program, it was a vibrant and active program. Section Leaders (SL's) were used for the introductory programming courses, as well as a handful of upper division courses. At this point, the structure of the SL Program was that each individual course had a team of SL's while the entire program had a set of SL Coordinators, seen in Figure 1. Each week, the entire program would have a "Community Meeting," which was led by the Coordinators and would act as a check in and conversation and feedback opportunity for everyone across the different courses. After Community Meeting, SL's in their first semester of SL-ship would stay for an additional training for about 10-12 weeks.

During the 10-12 weeks of training for SL's, Dr. McCann would cover new content each week, and focused on skills that every SL would need to know and gave the SL's different tasks week to week. The first week was preparing the SL's for their first lab discussion, while following weeks focused on good discussion management, office hours, student interactions, grading, and finally ending with a retrospective of the training and general view. During the duration of the training, SL's would sit in on experienced SL's discussion labs, grade mock assignments, create assignments, and engage in group discussions about observations or challenges.

Within their specific courses, SL's were expected to host office hours, grade assignments, and attend class if available. However, a key responsibility for SL's were hosting lab sessions that were a required part of the student's instruction. Once a week, the SL's would have a lab discussion with their section of students where they would review class material and practice the skills in a more structured manner. The lab discussions were run independently by the SL of a section, and while the instructor might develop the material, the SL delivered it.

## 2.2 Section Leader Hierarchy

Within each course, instructors could also choose to have a “Head SL” who was an experienced SL within a course. Not every instructor chose to designate a Head SL, and the responsibility varied per class and per instructor. Some instructors utilized the Head TAs as just a point of contact for other SL’s who were new or unsure while others had regular meetings with their Head SLs about course progress and development. Behind the overarching SL operation, Dr. McCann met with the SL Coordinators weekly to discuss more administrative topics. The SL Coordinators were a pair of current and experienced SL’s who were on a constant rotational basis. This meant that the term of a Coordinator was a single academic year; one of the Coordinators would be experienced in the role and would leave the following semester, and the other would be a new Coordinator, who would continue the next semester. The structure of the program can be seen in Figure 1. While the Coordinators could have an assigned course and a section of students, they might not always. Even if a Coordinator was assigned a class, they were never the Head SL. This was a conscious decision of the program structure to ensure a check-and-balance system and guarantee that no one student had too much authority.

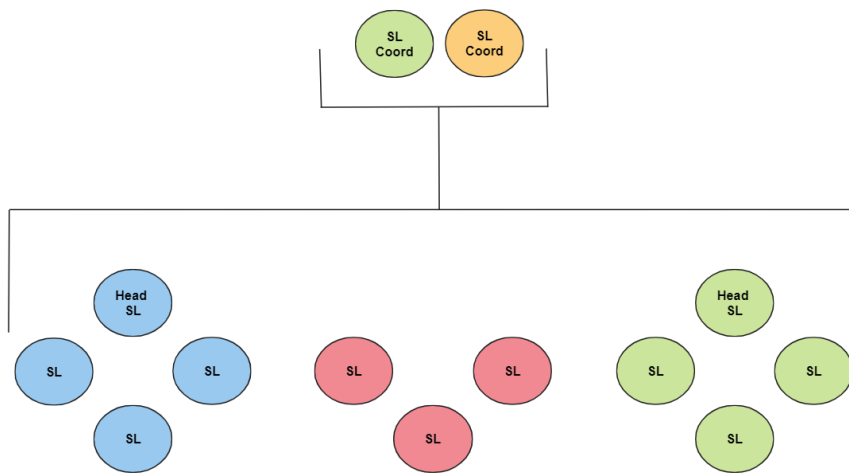


Figure 1: The SL Hierarchy



Along with the weekly responsibilities, Coordinators were also in charge of the hiring of new SLs and the new Coordinator. Hiring would always happen at the end of the semester before an SL would start. Sometimes, Head SL's or experienced SL's would assist the Coordinators, but the Coordinators were the ones primarily in charge of hiring. During the application process, applicants would go through a three-part interview. The first part consisted of a soft-skills, conversation styled informational interview. This served to get to know the candidate better. The second part consisted of a presentation on a relevant topic to showcase presentation and explanation skills. This was especially important for applicants because of the discussions they would be expected to host the discussion sections each week. The last part of the interview process was an office hours simulation where one of the current SL's would pretend to be a student and the candidate would work through a problem with them. Applicants would then be ranked and then get hired based on rankings, interests, and availability.

In order to be eligible to apply, applicants must have completed at minimum, the second course in the curriculum. In order to be hired for a specific class, they must have completed that class with a B or higher grade. Applications were extremely competitive. The SL program had high retention rates, meaning that unless they graduated, most of the current SL's stayed as SL's, limiting the amount of available positions. There was an incorrect notion of having job security as an SL, however, if an SL was good at their job and they wanted to continue being an SL, they would get priority over a new applicant. Towards the end of the SL program, it had grown to have between 2 and 3 dozen active SL's.

## 2.3 Section Leader Community

As a result of the high retention rate and the Community meetings, the program became more than just a job for Section Leaders and more than just a student position for the department. It was an integral part of the social circle of SL's and a major aspect of the Computer Science community as a whole. Beyond the job expectations, there were many department-endorsed social opportunities for SL's and many SL's became close friends outside of the program.

SL's also got distinct perks that other students did not have. Companies recruiting at the university noticed that SL's had developed specific marketable skill sets and were often strong students. It was not uncommon for companies to take SL's out for a paid meal which encouraged networking and helped SL's get a headstart in internships or new grad positions. At the beginning and end of every semester, all the SL's would have a meeting, that while had some business aspects, was primarily a relaxing opportunity. The first meeting would be to welcome everyone to the new semester and to meet other SL's while the second meeting would be a celebration of the semester. Several traditions developed over the years that signified how close the SL's had become. A few notable ones were the paper plate superlatives, the recognition of the new SL Coordinator via a "hatting" and the gifting of something red to the overseeing faculty member.

In the early 2010's, Dr. Todd Proebsting became the department head. While supportive of the Section Leader program, he did have concerns about the potential cliques that such a tight program could create. Students that had access to resources or benefits that others did not, and department-endorsed social clubs that not everyone could join could potentially create inequities within the general student population. As a result, many department-endorsed events were discontinued.

## 2.4 The End of the Section Leader Program

A few years after Dr. Proebsting started implementing his changes for the SL program, another major change occurred. The University was preparing to undergo an audit to renew their accreditation. The department had already been experiencing some pressure from the university to conform to a more standardized model of teaching support. There was concern that the accreditation organization would not approve of undergraduates “teaching” other undergraduates in the discussion labs.

In addition, the department hired a consultant to help improve their teaching practices and educational methodologies. The consultant interviewed students, faculty, staff, and section leaders as well as sat in on lectures and discussion labs. The initial feedback from the consultant was to move away from the section leader program and move towards the university endorsed model of regular teaching assistants/preceptors. In order to successfully set up the new program, the Coordinators worked with the Director of Academic and Support Services over the course of a year to plan and organize the new program. The biggest change that would happen would be the discontinuation of the individual sections. This meant that the term “Section Leader” would need to change, since there would no longer be sections.

At this point, the department was utilizing Undergraduate Teaching Assistants (UGTA's) in upper division courses, so the term was expanded to replace the term “Section Leader.” The Coordinators also established the role of “Course Coordinators” who would be the closest analogy to the retiring Section Leader Coordinators. There would no longer be overarching program Coordinators, instead, Course Coordinators (CCs) would be the head TA of a class, and work with the professor on managing the team of UGTAs. CCs were not confined to the one year long term that SL Coordinators were, however, there was a training position,

Coordinator-in-Training (CIT), that mimicked the experienced Coordinator and new Coordinator model. The intent was that Coordinators would meet weekly among each other to help one another and discuss ways to best prepare themselves and their teams, Coordinators were also expected to work with the professor on training the UGTAs, especially new hires. This was especially important because the weekly Community meeting was discontinued. The new structure can be viewed in figure 2.

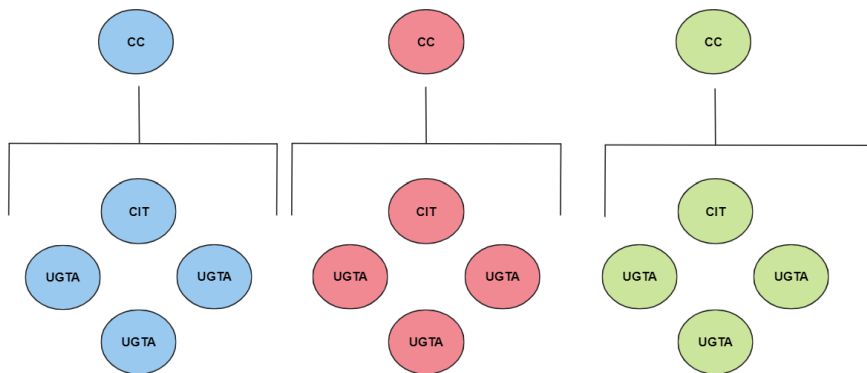


Figure 2: The Current UGTA hierarchy

The new UGTA program was launched in Spring 2019, and running at full capacity by Spring 2020. Unfortunately, there was a high department turnover, including the Director of Academic and Support Services, so many of the notes for the new program were lost. When the COVID pandemic hit in Spring of 2020 the nature of the program changed even more. Teams of UGTA's learned the job while doing, CC's did not speak to other CC's, and oftentimes UGTAs and CC's did not know others in different courses. While many good changes took place in the transition from the SL model to the UGTA model, some valuable aspects were lost between turnover and the uncertainty of the pandemic.

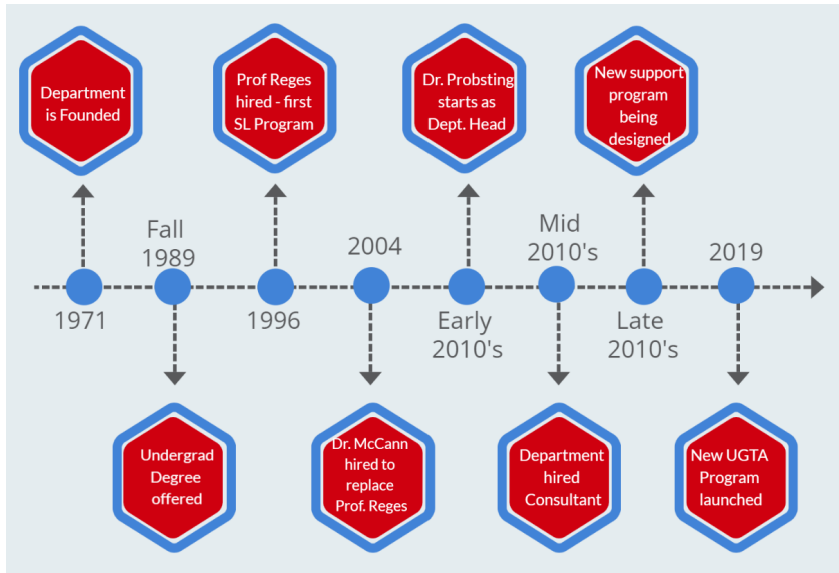


Figure 3: Timeline of the department

### 3. Research

After the staff turnover and resumption of the new UGTA program, the program looked a lot different than what was intended. Whereas the intended structure of the program was meant to provide inter-course support between Course Coordinators and other UGTAs, the actual structure focused on the individuality and focus of each course. While this provides many benefits to course structure, such as the ability to grow individually per class or professor, it also comes with drawbacks for the UGTA themselves. The feedback loop for UGTAs is limited, the expectations of the UGTAs varied drastically not only between classes themselves, but also between professors, and new UGTAs were often trained on the spot in an informal manner. Despite the problems, the UGTA program remained just as popular and valued as before the change, so many students did not view the weaknesses as limitations to the program, but rather just facts about it.

This meant that in order to pinpoint the best action item to have the greatest impact on the department, formal input was needed. Four different surveys were sent out to receive different perspectives from current UGTAs, UGTAs in their first semester, current CC's, as well as individuals who are no longer UGTAs for any reason. The surveys utilized Likert scales and free response prompts. In addition, interviews were conducted with lecturers, department staff, and department leadership.

#### 3.1 Surveys

The survey for first semester UGTAs focused on challenges or support they felt like they had as a new UGTA, while the survey for current UGTAs focused on the program as a whole. Not only did the survey for previous UGTAs touch upon the program as a whole, but also why

they chose to no longer continue being a UGTA. The interviews were semi-structured and focused on different things depending on the interviewee's relationship with UGTA's. Lecturers were asked questions focused on how they utilized the UGTAs, strengths or weaknesses in the program, and where they saw the greatest room for improvement. Department staff and leadership were asked questions that focused on the importance of the program within the department as well as where the program had room to grow.

The perspective of new UGTAs were vital because the experience of a first-time UGTA is easy to forget and easy to ignore. The way that they felt they were prepared, trained, and on-boarded to the job has a lot of impact on the longevity of the program overall. When asked about how they felt like they were prepared, popular responses included that other UGTAs that were assigned the same classes were willing to answer questions, professors were typically friendly and approachable, and questions were asked in a timely manner by both the professor and CC. However, areas where new UGTAs were reportedly not supported were having limited communication before the first day of classes, having limited guidance on how to speak to students, and no guidance on how to host office hours or grade assignments. In addition to first time UGTAs, feedback from UGTAs with at least one full semester were taken. The data and feedback from experienced UGTAs were similar to the responses of the new UGTAs, but it still had notable differences, in particular feedback about feeling unsupported when moving to a different course or professor. The specific breakdown of the data from both new and experienced UGTAs can be easily viewed in figure 4.

The third group of UGTAs that was important to consider were UGTAs who were no longer UGTAs, due to both graduation and otherwise. The way that this group of UGTAs reported being both supported and unsupported is unlike the current UGTAs. The most common

ways of being supported, according to previous UGTAs, were having community support between different levels of the expertise within a team and communication channels were direct. However, professors were reportedly closed to feedback, there was rarely follow-up or follow-through when concerns were brought up, and explanations of expectations or feedback were rarely given. It was especially difficult for UGTAs to adjust to new classes or professors because the workload and work expectations varied so drastically. Reasons for leaving the UGTA program, aside from graduation, were related to lack of support and lack of growth opportunities. Many past UGTAs claimed the programs needed to have a major restructure to consider returning. These comments can be seen in Figure 5 below.

Newly Hired UGTA Feedback		Experienced UGTA Feedback	
Pros	Cons	Pros	Cons
UGTAs in same classes offering support	Limited pre-semester communication	Communication within a team is strong	Lack of Growth opportunities
Professors being friendly and approachable	Limited Training on Office Hours	Professors and CCs are responsive and helpful	Lack of general training
Questions getting answered in a timely manner	Limited Training on student interactions	Community within a specific class is strong	Limited Support when moving to a new professor or class
	Limited Training on grading assignments		Community between classes is limited

Figure 4: Feedback from newly hired and experienced UGTAs on the program



Previous UGTA Feedback	
Pros	Cons
Different levels of expertise in a single class	Unable to provide input on class structure
Direct Level of Communication	Lack of follow-up on expressed concerns
	Difficult transition between courses
	No Opportunity for Growth

Figure 5: Feedback from Previous UGTAs

The last survey collection was from the perspective of the CCs. CC's provided valuable insight as they had both perspective from the student-worker/UGTA side and as an instructor on administrative tasks. According to this survey, many UGTA's had an abundance of potential and desire to do well, but needed guidance and constant feedback - more than CCs had the capacity to give at quality levels. This was even more evident when none of the CCs felt prepared for the leadership position when they started. So, at the beginning of CCing, CCs felt overwhelmed and unsure in their roles. Something that was widely reported as helping the transition was responsive and encouraging professors.

### 3.2 Interviews

Faculty and staff were the second part of the data collection process. Professors that worked with UGTAs had valuable input about how the performance of UGTAs were useful and important to the structure and flow of a specific class, as well as areas for improvement for the UGTAs. In addition, department leadership and advising were given the opportunity to provide input about the UGTA program on a systematic level discussing the benefits and drawbacks of

the program within the department as a whole. All interviews were conducted in a semi-structured manner, and while each individual had unique opinions on the role of the UGTA and the importance of the UGTA program, common themes emerged when looking at the responses.

In general, the overall experience of the UGTA program was that it was a positive feature of the department, but had large rooms for improvement. Positive qualities of the program included that it allowed for students to develop a unique subset of skills they might not be able to exercise otherwise, such as reading others code, debugging, explaining topics to others, and general leadership skills as well as reinforcing content for the UGTAs themselves. UGTAs were also reported to take on a sense of responsibility for their assigned courses demonstrating investment and care for their work. Additionally, professors remarked that students currently enrolled in the class greatly benefited from having UGTAs in the class as an auxiliary support.

Even so, faculty and staff revealed some large areas of growth within the program. Many UGTAs were thought of as underprepared and undertrained. Because of their commitment to specific courses, UGTAs could be defensive or closed off to changes to a class when a new professor took over. Professors also found themselves to be repeatedly giving their UGTAs reminders of logistics, course content, or other miscellaneous tasks related to the job - which sometimes became more of a hassle for professors than just doing the work themselves. In regards to the larger program as a whole in comparison to the retired SL program, UGTAs seemed to be more invested in the class itself, but less connected to their peers and less open to feedback by more experienced UGTAs.

### 3.3 Data Analysis

Comparing the data of the program between the UGTAs and the faculty and staff shows both patterns in the overarching program and disconnects between where the department wants its UGTAs to be and what UGTAs want to do. While the disconnect is not debilitating to the program as a whole, bridging the miscommunication can increase the productivity and positive impact of the UGTAs for both their personal growth and the influence they have over a course.

Between both the UGTAs and the faculty, it is agreed that UGTAs need more structure in their day-to-day positions. New UGTAs were left in the dark up until the first day classes and all the training happened on-the-job and mostly when they needed to know something. Professors working with the UGTAs felt like they were generally capable, but lacked the ability to develop soft skills that are vital to the job. Experienced UGTA's also expressed a desire to have the ability to have more responsibility to show growth in their position.

This indicated several options to improve the program. However, because of how deep-seated the program is to the department and the history of the program development to get to this point - there would be pushback to major structural changes. Changes related to professors would also need to be avoided because of their unlikeliness to embrace extra work regarding the UGTAs.

Based on the data collected and the restrictions of what was possible, two courses of action were set in place to improve the existing UGTA program. The primary goal would be to implement a training program that new UGTAs would be required to complete before the start of the semester to teach them the expectations and skills they will need at the beginning of their UGTA semester. There would also be a secondary, smaller goal of creating a path to show growth or formally take on more work throughout the semester.

## 4. Discussion

Finding the best ways to develop the program was a challenge because of the different needs that were expressed. Professors with limited availability to participate in any extensive training program, UGTAs often unavailable until the first day of classes, and the needs of each class, or even professors with varying expectations in their UGTAs creates challenges in creating a training program that is beneficial for all participants. The UGTA program has also been established for the greater part of the past 5 years and introducing fundamental changes would be difficult, especially if addressing opportunities for vertical growth within the program.

### 4.1 Training Program

One of the ways decided to improve the UGTA program was through the creation of a training program that all UGTA would need to undergo when first hired. It was clear that the training to be developed could not be specific to any course, but there were other ways to ease new UGTAs to their respective position because of common themes that every UGTA will experience - even if the specifics of it are different for each UGTA. Such themes included how to interact with different students, how to prepare for office hours, and things to keep in mind while grading work. Extra care was needed to make sure that each of these topics were broad enough to apply to a wide-range of classes. In addition, tutorials on how to use certain UGTA systems might be needed, including but not limited to navigating UAccess, using Gradescope as an instructor, and using D2L as an instructor.

Before any of these could be addressed from an instructional standpoint, finding the best schedule was necessary. A significant weak point in the previous SL program was that the new SL training took place over the course of a semester. This meant that certain topics weren't

covered until weeks into the semester, when most SL's had already been practicing and figuring it out themselves. This was an important weakness to target, to maximize the efficiency of the training.

Discussions of weekend training took place, but due to various religious and social reasons, these seemed impractical. Another weakness of a weekend training was that it would take place after the start of the semester due to the semester starting in the middle of the week, and many students moving into apartments or dorms the weekend before classes start. An alternative to that was to host the training all on a single day the day before school started. This seemed to work the best for timing, however, it would be a long and exhausting day, and UGTAs would not benefit as much as they could.

The final schedule decided upon was a two-day schedule, where each day would consist of a half day training focusing on different aspective education during the two days leading up to the first day of class. UGTAs would be informed of this time commitment during hiring and expected to accommodate the commitment. UGTAs who were unable to attend the training, especially those doing it for credit and could not be expected to be on campus before the start of class, were given asynchronous options.

The first day would be an informational, receptive agenda with minimal interactive learning. During this day, UGTAs would be primarily listening and gaining insights, rather than practicing skills themselves. The second day however, would be a more hands-on and engaging program where the training UGTAs would practice the skills learned the day before in activities facilitated by experienced UGTAs. This would allow the participants the ability to focus and process the content overnight before applying the skills. Breaking the schedule into two short days would also prevent information overload and fatigue in participants. In addition to the

training days, participants would be given the opportunity to watch asynchronous tutorial videos as-needed on the different softwares they might be expected to know or be unfamiliar with.

After deciding the schedule of the training, the next step would be to develop the educational material for each of the three topics identified: student interactions, office hours, and grading. This content would be taught on day one using powerpoint slides and videos and then put into practice on the second day. Student interaction would be the bulk of the training, as it is the foundation of the UGTA job: interacting with students. The discussions following the student interaction for office hours or grading would build off those ideas, but place them in specific contexts.

## 4.2 Student Interactions

Student interactions took the longest to create because of its importance and broad nature. The slide deck focused on defining what it meant to interact with students, why interacting with students effectively is important, and different situations in which UGTAs might find themselves in. In addition to traditional lecture-style teaching, the slide deck capitalized on periodic workshop-style discussions and conversations about the topics at hand.

The student interactions part of the training focused on how the UGTA engages with students. The training focused on defining what “engagement” means and different examples of it. It also looked at the best ways to engage with students and challenges that can be easy to not anticipate. Participants in the training were encouraged to reflect and discuss meaningful past interactions with their own experiences. The benefits of active engagement for both students and UGTAs are also covered to put more context. After the background and context of what engagement meant, the training looked at skills to develop and best practices to have.

The second day of training, where the training UGTAs underwent active practice, participants practiced student interactions. During the activity, a single training UGTA would practice the skills as a UGTA, while the other training UGTAs role-played as students. Experienced UGTAs facilitated these group simulations and helped assign roles randomly given ranging from different student types (such examples include a disengaged student, a student who is distracted, or a student who is engaged) to the practicing UGTA. The facilitating UGTA would silently observe the group as the practicing UGTA navigated the different student attitudes while working on a small coding activity referred to as an ICA<sup>2</sup>. After the practice time was over, then the facilitating UGTA gave feedback and the group had a conversation about their own observations. After the allocated discussion time, training UGTAs swapped roles and groups.

### 4.3 Office Hours

The second part of the training curriculum focused on office hours. It was important to include office hours in the training, because every UGTA is expected to host them each week. Office hours were also reported to be one of the most severe causes of anxiety among UGTAs. This is due to lack of communication of expectations before the start of the semester. Office hours also require UGTAs to practice skills that they hadn't developed as strongly, especially if they start working while still completing the foundational courses. These skills include reading other students' code, helping navigate the debugging process, explaining concepts to students, and following along a different logical path than they might want to do.

The informational first day of the office hours training focused on what to expect from office hours and how to help break down problems they might be given. The slides also reviewed

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<sup>2</sup> ICAs are "In-Class Activities" which are popular CS class activities designed to reinforce topics in isolated practice problems

the skills that UGTAs would be expected to have or develop to be effective at hosting office hours. Similar to the student interactions, while the informational day focused on presenting the topic, there were built-in opportunities to talk about what is being discussed both in small groups and the larger group.

The second day practicing session would mimic the student interactions training in the sense that the training UGTAs would continue working in groups. However, the facilitating UGTAs would have pre-written, half-completed solutions to a problem. Members of the group would take turns as a practicing UGTA, working with the facilitating UGTA acting as a student, trying to progress with the solution at hand. If not the practicing UGTA, the other UGTAs observe the interaction and discuss at the end. After the end of the discussion, groups would change to a new facilitating UGTA section.

#### 4.4 Grading

The last and shortest section of the training involved grading. This section was the hardest to develop because of the varying expectations between each class. The grading from each class is unique. This meant that this section of grading could not focus on grading practices specifically, but rather had to be about ways to ease nerves and introduce the training UGTAs into grading. The training slides focused on allowing the UGTAs to be retrospective about their own grading experiences as students and what they did or did not like. This section of the training did not have an interactive practicum equivalent on the second day.



#### 4.5 Secondary Goal: Creating Vertical Growth for existing UGTAs

In addition to creating a training program for new UGTAs, a secondary goal was created to help existing UGTAs. As explained previously, the UGTA program structure is isolated between classes and in larger classes include a team of UGTAs led by a singular CC. The CC is an experienced UGTA and carries a different set of responsibilities. Sometimes an experienced UGTA will become a Coordinator in Training, and learn the responsibilities of an existing CC as they get ready to graduate.

This current model has a couple flaws. First and foremost, many CC's stay in their jobs over the course of multiple semesters and become comfortable with the roles. It can be difficult to find individuals who want to learn and be responsible for all of the tasks a CC has. Experienced UGTAs do not necessarily want to become a CC, but are treated and looked at the same as a UGTA who is inexperienced. In addition, CC's sometimes feel obligated to take on extra tasks throughout the semester even if they don't have the bandwidth to do so.

This creates a need for an additional need for a middle position between CC and UGTA. The Coordinator in Training Position acted like this, but was a solitary position and often left unfilled when UGTAs were not interested in directly becoming a CC. The middle position created was the "Senior UGTA" position. Senior UGTAs were experienced UGTAs who were willing to take on extra responsibilities as needed, but didn't necessarily want to become CC. It was also an opportunity for experienced UGTAs to demonstrate vertical growth within their job. When it became time to find a new CC as well, the Senior UGTA pool provided multiple candidates who were already partially trained. Senior UGTAs could also help with the training and be the facilitating UGTA during practice activities or provide input during the informational sessions.

## 5. Reflection

The first iteration of the training program in Spring of 2023 had about 25 training UGTAs and 4 Senior UGTAs facilitating the conversations and group activities. Piloting the training program in Spring was preferred because of the smaller number of starting UGTAs compared to the fall semester. In addition to the training program described above, the Director of Academic and Support Services for the department gave a general welcome to the UGTAs and informed them of the different resources or general knowledge to have about the position - general administrative items. There were a number of lessons learned that will need to be adjusted or discussed moving forward with larger versions of the training.

### 5.1 Observations from Pilot Program

At a high-level, the training program itself was a success. Participating new UGTAs were engaged and the facilitating UGTAs were pleased by the practice activities and workshops to prepare for the job. However, there were still many lessons about the execution to take note of. First and foremost, there was no grading simulation. This was an intentional decision, but after speaking to Dr. McCann about the original SL training, including a form of grading practice could be useful, even if it is not directly applicable to how or what the UGTAs might be doing in their specific classes. This could be done by giving the training a rubric and having them grade a sample submission independently. After everyone is done grading, discussions could happen about what was good or bad about the grading and why any inconsistencies exist. Then, given a new sample submission, groups would grade together, and discuss the improvements or changes made. For most of the training UGTAs, this simulation will not cover exactly how to grade, but it helps show how grading biases or inconsistencies can arise.

The second observation is related to the student engagement and office hours activities. For the student engagement activity, only one copy of each ICA was printed and used. This was a limiting factor, because the ICAs could not be written on, since they needed to be reused multiple times. Moving forward, having multiple copies of an ICA would be beneficial to the groups. For the office hours activity, originally, facilitating UGTAs would have their partial solutions on the computer to run. This was problematic though, because the training UGTAs who were not actively practicing were largely disengaged. To improve this, the partial solutions should be written on large whiteboards viewable by everyone. Unfortunately, this means that code won't be able to be tested, but this is a reasonable tradeoff as the goal isn't getting code to work properly, but to rather work through different scenarios. To keep the engagement with the observing UGTAs, feedback forms will be used. If the training UGTA isn't actively being engaged, they are writing their observations and feedback for the practicing UGTA.

The third largest observation is the importance of those in attendance at the training. Aside from the Director at the beginning of the first day, there were no faculty or staff members present for the training. This was not an intentional decision, however, it had beneficial results. The training was led completely by other Senior UGTAs and CCs, which made the feedback flows more natural and less formal, as it was essentially a peer-led training. There were conversations about incorporating professors or faculty in specific parts, but if those were to be pursued, their involvement should be isolated to designated portions. In addition, the facilitating UGTAs were fully present on both days of the training. While extra support is helpful for logistical reasons on the first day, a full team of facilitating UGTAs are not needed until the activities on the second day.

Along with the observations from what the pilot program was able to accomplish, there were a number of original goals that were not reached and should be pursued for the future. The biggest missing feature from the program was the asynchronous tutorial videos. These were not prioritized originally because of time constraints and the inability to decide what the best format to deliver optional videos would be. A secondary, implicit, goal that was missed was collecting formal feedback after the program to gauge the success of it and make appropriate changes for future iterations.

## 5.2 Sustainability

In order for this project to be successful and have the impact it was intended, it needs to be able to be passed on or accessible in the future. Not only are the practice problems, partial solutions, and slide-decks important for executing future training sessions, but the notes about content, time expectations, and execution expectations are necessary to avoid hiccups down the road.

Ideally, this training is not an isolated event and will continue to happen for the foreseeable future each semester, with necessary adjustments being made each time. A collection of all the relevant materials needs to be easily accessible, and modifiable, as necessary. To accommodate this, the materials were designed to be accessible online and shared with multiple people as needed.

The larger problem would be finding someone to lead the training. Until this point, all the development and delivery of the content has been done by a singular person who knew the in's and out's of all the content. In order for this to be successful as a continuous program, the best solution would be to find one or two CC to lead the training with the support and help from

Senior UGTAs on activity-centric focuses. In order for this to happen, the department needs to take an active role in the training and designating someone to be in charge of it beforehand.

## 6. Conclusion and Future Works

Like the original UGTA program, this training curriculum was designed to be adaptable in the future as needed. It was designed to address the needs of the UGTAs and Professors at this point in time, but those needs may change over time. It is important that the content is flexible, it is also important that the people in charge of the content in the future knows that it can be adjusted and changed. This also plays into a secondary need for further research to be done on the success of the program. At this stage of the project, enough data is not available to truly assess the success of the program. This is something that should be looked into further to examine the effectiveness of the training and make adjustments as needed.

In addition, the missed goals still need to be completed. Creating a grading activity for the training UGTAs is the largest deficiency in the current version. This will probably be included in the Fall 2023 training, but there is room for growth on it. The other action item is to create the tutorial videos on miscellaneous topics related to the position. Ideally, these videos would be short, engaging, and informative walkthroughs on how to submit hours or navigate gradescope quickly.

In conclusion, The University of Arizona's Computer Science Department has had great success with its Undergraduate Teaching Assistant (UGTA) Program where UGTAs help both professors and students in larger courses. However, the program also has had opportunities for growth, specifically in terms of providing better training for new UGTAs and allowing for more flexibility in the job, that has not been explored. Recently, the program has made improvements to address these areas of concern, including implementing a mandatory two-day training program for new UGTAs and creating a new role for experienced UGTAs to have some vertical growth. These changes were put into effect in the Spring 2023 semester.

## 7. Personal Note

This project has been an eye opening and impactful experience for me. I started as a student in the department in Fall 2019. At this time, the UGTA program was running at full capacity, but professors still used the term “Section Leader” or “SL” regularly. That school year, much of the described staff turnover happened, and the COVID-19 pandemic shut down the University. I started working as a UGTA in Fall 2020. When I went through the interview process, this was the first time the current Director was in charge of it. He was struggling with the initial responsibility of the hiring paired with the unfamiliar online-interviewing and hiring process.

Due to this, a lot was unclear to me as a candidate. At the time, I brushed it off as COVID-19 craziness. A lot was happening and no one really knew what to expect long term. My professor that semester organized a pre-semester meeting where he explained his general expectations for the first day and what to anticipate during the first week. Even with the pre-semester communication, my first couple weeks as a UGTA were very stressful and anxiety filled. I did not know if I was doing anything correctly or what I could be improving on. I learned quickly, but it was not an experience I particularly enjoyed.

By the end of my first semester, I had been identified as a good candidate to become a CC, and by my second semester I was in-training. Something that I immediately did as the CC in-training was create a series of documents and notes specifically for this class that would be useful for UGTAs starting out for the first time. Documents included how to host office hours, how to submit hours, and managing logistics specific to the class. It was positively received by the new UGTAs that semester. By my third semester, I was the CC for the class.

The third semester was also when the department moved back to in-person modalities. For the first time in over a year, things were back to normal. Something that really stuck out to me was that my experiences starting as a UGTA were the same as what the new applicants were going through. This meant that my initial observations were a foundational problem rather than the stress from a pandemic. I tried to help the UGTAs that I could, but I only had direct access to so many of them. After speaking with other CCs and experienced UGTAs, there seemed to be a theme of lacking consistency between classes.

The most immediate and obvious solution would be to restructure the classes and department itself, but that was out of the scope of what I could do during any project. The secondary solution that was an option was to take a deeper look into the UGTA program and identify what could be improved there and how the department could better support their UGTAs. Thankfully, the department was very open to my project and worked with me in more ways than one to ensure that the work I was doing would be successful. I trust them to continue it even after I graduate.

The project itself was a personal journey about my own interests post college. I have known for the past two years that I did not want to work in industry or go into research like the rest of the peers. I genuinely enjoyed my job as a UGTA and other miscellaneous involvements throughout campus and have wanted to find a way to intersect my interests for CS and my interests in education and academic support. This project was a great first step in that direction.

Overall, I would deem the past two semesters a big success. I accomplished a lot more than I thought was possible. I also left room for improvement and adaptations, which I hope the program experiences. I would like to thank all the people who helped me get this far. The professors and fellow UGTAs who assisted me in my research, Martin Marquez who supported



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