

Reflections on 10 years of Operating a Computer-based Testing Facility: Lessons Learned, Best Practices

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1 Introduction

Assessment is an integral component of any educational experience, but it is also a practice that becomes increasingly difficult for faculty to implement well as class enrollments grow [1], because as class sizes increase, administering assessments becomes increasingly resource intensive [2] requiring faculty and course staff to commit increased amounts and energy towards managing the logistics of exam administration [3]. The additional resources required for administering assessments in courses with larger enrollments often lead to a decrease in the number and type of assessments used in a course [4, 5], with faculty often relying on assessment practices that are not educationally beneficial to students [6].

Managing assessment for large-enrollment courses is a challenge that many engineering programs face. In response to these challenges, in Fall 2014, the Grainger College of Engineering at the University of Illinois at Urbana-Champaign launched a computer-based testing facility (CBTF) designed to reduce the logistical overhead associated with paper-based exams for courses with large enrollments while also creating opportunities to improve the assessment process for everyone involved [7]. In this paper, we reflect on that experiment, discussing how the operations of the CBTF have evolved over ten years and the lessons we have learned. We begin by summarizing our program's history and then discuss lessons we have learned related to staffing, the utilization of dedicated testing labs, and policy changes. In sharing our experiences, we hope other institutions that are questioning how to provide better assessment at scale will benefit from the knowledge that we have gained.

2 Our Computer-Based Testing Facility (CBTF) History

Before discussing the history of our CBTF, it is important to clarify what we mean by CBT. This term can take on a variety of meanings, but for this paper, CBT refers to an assessment model that offers students asynchronous testing in dedicated and secure computer labs with live proctoring, similar to models that other institutions have or are in the process of implementing [8, 9].

The success and continued relevance of our implementation of CBT is in part evident through the growth that we have experienced in our operations over ten years of administering exams. As illustrated in Fig. 1, the utilization of the CBTF has steadily increased each academic year in terms of number of courses testing in the CBTF (see Fig. 1a) and total enrollments (see Fig. 1b). Excluding the academic year (AY) 2020-2021 during the COVID-19 pandemic, AY 2022-2023

highlights our largest enrollment with approximately 15,000 students from over 50 courses taking exams each semester in the CBTF. During Fall 2023, the CBTF also administered a record number of exams, recording over 90,000 reservations. The ability to support the growing number of students and courses utilizing the CBTF is made possible through operating three dedicated testing facilities that offer testing sessions ten hours each day, seven days a week. We project that the utilization of our labs will continue to grow as we bring a fourth testing facility online in Spring 2024 in partnership with the College of Liberal Arts at the University of Illinois at Urban-Champaign, expanding our reach to a new area of campus and opening the possibility of bringing more humanities-based courses into our labs.

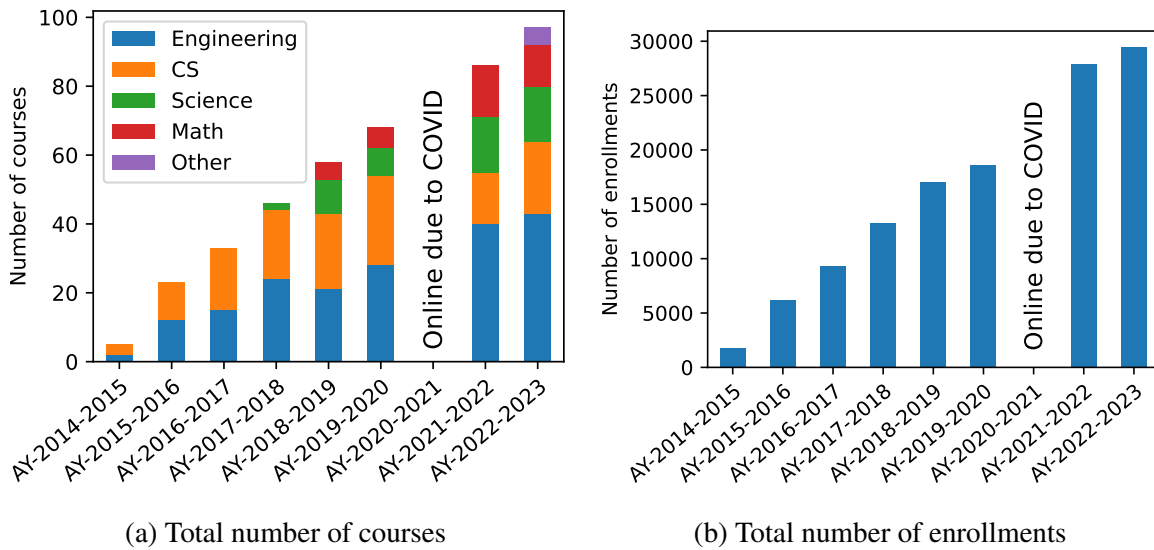


Figure 1: Historical CBTF Growth

The impact of the CBTF is also evident through the research that has evaluated assessment practices utilized in the CBTF. Since the CBTF’s inception, building pedagogically sound, research-based best practices for assessment has been a focus of the program coordinators. Through partnering with faculty who were utilizing the CBTF, we have been able to explore the impact of implementing mastery-based assessment principles [10, 11], retrieval practices [12, 13], second-chance exams [14, 15, 16], and exam feedback mechanisms [17], demonstrating how these practices can contribute to positive student outcomes and shaping how assessment is conducted in the CBTF. Additionally, research has explored issues of exam integrity [5, 18, 19, 20, 21] and student scheduling behaviors in the context of asynchronous testing [22], leading to more secure exams and scheduling practices that better align with student practices. Currently, our research agenda is focused on better understanding how students experience test anxiety in the CBTF with the intention being to develop lab policies and student supports that will help to mitigate some of the exam anxiety experienced by students.

Over the past ten years, as the CBTF has grown from two to over fifty courses, the overarching goal of the CBTF has remained: “to make assessment with exams better for everyone involved – students, faculty, and course staff” [7]. In sharing our approach and what we have learned, we hope to be able to support other engineering programs that are seeking solutions for providing

assessment at scale.

3 Staffing

Developing an administrative structure that allows for sustained and consistent growth has been vital to the CBTF. Similar to many new programs, the initial CBTF years are best characterized as a start-up mentality, with a small group of faculty and staff collaborating in every aspect of the center's administration. However, growing administrative needs surpassed the time and effort these individuals could invest, leading to the current administrative structure. Operations are now supported by approximately 60 undergraduate and graduate hourly employees, two office support specialists, a coordinator, and an assistant director. In the following sections, we discuss how each of these roles is critical to providing consistent assessment at scale.

3.1 Undergraduate and Graduate Hourly Employees

Offering testing sessions twelve hours per day, seven days a week with over 160 computers allows the CBTF to administer over 6,000 exams weekly. Maintaining this level of testing is only possible because the majority of proctoring is conducted by trained undergraduate and graduate hourly employees.

Hourly Employees Experience has taught us that staffing our labs with undergraduate and graduate students, hired as hourly employees, provides the CBTF with the flexibility needed to support testing throughout the semester. We require student employees to commit to six hours of proctoring weekly and base our hiring and scheduling on this expectation. The six-hour commitment helps estimate our staffing needs and creates an employee pool with some proctors desiring to take on extra shifts. This engineered scarcity creates a dynamic of proctors trading shifts and requesting coverage for shifts if scheduling conflicts arise. Because of this, most shifts are quickly claimed by proctors wanting additional hours, helping to ensure that labs are adequately staffed.

Characteristics of Our Proctor Team The composition of our proctoring team is a critical component for maintaining quality administration of assessments. Our goal each semester is to hire a proctoring team that is approximately 80% undergraduate students and 20% graduate students. While labs could be staffed completely by undergraduates, we have learned that undergraduate students are less likely to be available to work before the start of a break in the semester or during special events on campus. Conversely, graduate students tend to be more available to cover shifts during points in the semester when undergraduates are less available. While added cost is incurred because campus norms require graduate students to be paid a higher wage, that expense is worth the staffing stability it provides.

Another factor that is considered when hiring proctors is whether applicants have experience taking exams in the CBTF. For many years, our policy was to not hire engineering students because they could be enrolled in a course that was testing in the CBTF. This policy was based on concerns that proctors who were also taking CBTF exams might see exam content which could benefit them personally or their classmates. As our operations expanded it became more difficult

to hire enough non-engineering students as proctors. As a result, in Spring 2023, we piloted a policy that allowed us to hire students who would also be taking exams in the CBTF. These proctors were required to complete an exam disclosure form declaring their CBTF exams and acknowledging that they were not permitted to proctor during any portion of their exam windows. Additionally, they were required to indicate that they were unavailable in our scheduling platform during their exam window dates. The repercussion for proctoring during their exam windows would be a CBTF-initiated academic integrity investigation with their professor. Following the successful piloting of this policy, we have transitioned to hiring an increasing number of proctors who have exams in the CBTF.

In addition to increasing the number of students eligible to proctor in the CBTF, an advantage to hiring proctors with experience testing in the CBTF is that these proctors can better support students. They already have knowledge of PrairieLearn [23], the predominant learning management system used in the CBTF, allowing them to better support students in troubleshooting technical problems. Similarly, they are also already familiar with CBTF policies, making onboarding these proctors easier. While we anticipated these benefits, our proctors with firsthand experience testing in the lab also bring an interesting student perspective to their roles. During interviews, these proctors often reflect on their experiences taking exams in the CBTF and share how proctors either positively or negatively impacted their time during testing. Part of their motivation for applying to become a proctor is because they understand the stress associated with exams and hope to make the testing experience better for future students.

Without both undergraduate and graduate student proctors, we would be unable to provide the extensive testing hours that our CBTF offers. Further, hiring hourly employees and utilizing students who already have experience in our lab fosters a better student experience. Employing student proctors does, however, pose the challenge of providing them with appropriate training and support in the labs.

3.2 Office Support Specialists

Office support specialists are full-time support staff who help ensure the quality of the proctoring, both by proctoring themselves and by training and supporting our student proctors. Additionally, these full-time positions allow for the implementation of additional testing options.

Proctor Training Each academic year, approximately one-third of our proctoring staff is new to the CBTF, largely due to students graduating and changes in their course loads. Before the addition of the office support specialist positions, we often relied on experienced student proctors to orient new hires to the CBTF because it was not possible for the coordinator to train everyone while also overseeing daily operations. The unfortunate drawbacks included inconsistent training for new proctors and training that spanned numerous weeks into the semester due to difficulties matching the availability of new proctors with experienced proctors.

An immediate benefit of transitioning proctor training to the full-time support staff was that training could be completed faster and with more consistency. In Fall 2023, our first semester with two full-time support staff positions, we trained approximately 40 new proctors in under two weeks. In previous semesters, the process commonly lasted three times as long for only 20

proctors. The full-time staff allowed us to dedicate the first weeks of the semester to training, providing more opportunities to match new proctor availability with training shifts.

More importantly, with guidance from the full-time support staff, proctor training has progressed from a relatively unguided shadowing experience into a multi-stage, documented training program. This program involves an in-person viewing of training videos with opportunities to apply that information, a mock student experience with new proctors taking an orientation quiz in our lab, and a shift shadowing full-time staff. Each proctor completes this same training, guided by an office support specialist, ensuring that all proctors receive similar experiences and the necessary knowledge. Additionally, with each cohort of new proctors, the specialists evaluate and iterate the training program, further improving the process. We can now reach the necessary staffing levels faster, with proctors gaining firsthand experience earlier in the semester, thus better preparing them for when more difficult student questions or cheating scenarios arise later in the semester.

Proctor Support and Oversight While proctor training is an important first step towards consistent implementation of lab policies, ongoing support and oversight of the proctor team is also necessary. With up to 1200 students moving through our labs each day, proctors are regularly handling student questions, concerns, and troubleshooting. Proctors are well equipped to handle most issues they see, but at times require additional support in understanding how policies apply in specific instances. With 45% of the office support specialist's responsibilities dedicated to proctoring, they can provide immediate support in these situations. If cases require intervention from IT staff or the coordinator, full-time staff can guide proctors through which information should be communicated and to whom, leading to issues being resolved faster. While our Slack channels facilitate most proctor support, a specialist's presence in the lab leads to quicker and more consistent resolutions to proctor questions and relieves the coordinator from needing to always provide that support.

The specialist position also provides more direct oversight of proctors. Simply having full-time staff in the labs often enhances proctor performance. Proctors are more attentive and focused on their responsibilities when an authority figure is present. Additionally, through the office support specialist positions, we can be more intentional in our oversight by conducting proctor evaluations. Each semester, as part of ongoing training, proctors are observed and evaluated for one shift. Following each observation, the specialist conducting the observation meets individually with the proctor to review the observation and provide constructive feedback. This review process contributes to more consistent implementation of lab policies and informs hiring decisions for future semesters.

Expansion of Testing Options Beyond training and managing the proctor team, the full-time support staff positions have increased the types of testing we can support. Traditionally, in-semester and final exams have been the focus of the CBTF's services, but in Fall 2023 the CBTF began administering proficiency exams for two engineering departments. These exams, which take place either before classes start or during week one of the semester, allow students to demonstrate mastery of a course's content before the start of the semester, potentially allowing them to earn academic credit and eliminating the need for that student to enroll in the course.

However, because the timing of these exams aligns with when faculty and staff are preparing for the start of the semester, departments often struggle to administer them. In the past, the timing also created logistical challenges for the CBTF as most student proctors were either not on campus or not yet trained. However, with our full-time support positions, we could provide this service by staffing our labs before students returned to campus.

By administering proficiency exams, we not only allow faculty and staff to better focus on semester preparation, but the asynchronous model also benefits students. Both departments offering proficiency exams saw an almost 200% increase in the number of students taking proficiency exams, likely due to the flexibility from being able to schedule their exam over a five-day testing window instead of during a limited set of prearranged times. The CBTF also benefits from administering proficiency exams because the timing of these exams, during the first week of the semester, provides more opportunities to train proctors on live exam sessions earlier in the semester.

Reassignment of Other Duties Finally, the specialist positions allow other responsibilities to transition away from either the coordinator's responsibility or student committees. Our CBTF had three committees focused on (1) maintaining lab supply inventory, (2) processing letters of accommodation for students with testing accommodations, and (3) responding to messages in our email inbox. The volume of work previously made student involvement necessary in all three committees. However, after adding the specialist positions, the committees for email and letters of accommodation have been dissolved, moving these more sensitive tasks to our full-time employees. The inventory committee is still active, but oversight for that committee is the responsibility of a specialist, whereas in the past students largely organized the work themselves. Similar to other instances discussed, transitioning these responsibilities to the full-time support staff positions provides more consistency in lab operations.

The office support specialist positions play a critical role in facilitating and supporting the growth of the CBTF. Without these positions, it would be impossible to provide the necessary staffing and consistency that is required to administer 90,000 exams each semester.

3.3 Coordinator and Assistant Director

A final administrative development was the addition of an assistant director position. As our CBTF grew, the job of the CBTF coordinator grew to be larger than one person could manage resulting in the position being split. The coordinator was promoted to assistant director, and an office support specialist was promoted to coordinator. Under this new administrative hierarchy, the assistant director was charged with focusing on long-term planning, supporting faculty, and coordinating with units across campus, while the oversight of daily operations became the responsibility of the coordinator. The CBTF assistant director takes input from an advisory committee of faculty and students and also consults with a student committee for feedback.

Expanding Testing Capacity The CBTF is one of the most heavily utilized spaces on campus and we regularly receive inquiries from courses requesting to either transition to testing in the CBTF or to increase their number of CBTF exams as they move toward a more frequent, low-stakes model of assessment. Because of this increasing demand for testing, a priority of the

assistant director position is to identify ways to meet current and future testing demand. This focus has contributed to the addition of a new dedicated testing lab in Fall 2023 (Fig.2), a collaboration with an individual department that provided the space and assumed the cost of developing the lab in exchange for allocated testing space for their courses. Similarly, through collaborating with the College of Liberal Arts and Sciences on campus, we will be bringing a 110-seat facility online. Together these two labs will more than double overall testing capacity which is projected to meet testing demand through AY 2024-2025. These expansion labs emphasize the need for an assistant director to partner with other stakeholders. With the support of an assistant director, time and resources could be dedicated to pursuing these projects while daily operations continued under the guidance of the coordinator.



Figure 2: New CBTF Testing Facility

While expanded testing is primarily based on new dedicated labs, remote testing centers are another source of growth. In Spring 2023, the CBTF established a three-computer, satellite facility to provide computer-based exams for students participating in internships in Chicago, while concurrently enrolled in engineering courses on the Champaign-Urbana campus. Discussions to add this satellite lab had been ongoing with little progress, mainly due to complications concerning sufficient IT support. Overcoming these complications required time to work with various stakeholders to identify solutions, a difficult task to coordinate while also overseeing 1200 daily exams. The addition of the Assistant Director afforded the necessary administrative support for establishing new dedicated campus labs and the satellite facility. Recognizing that both the additional labs and the satellite facility's current arrangement will only accommodate growth for a short time, the focus of the assistant director remains on identifying means to further expand testing capacity.

Faculty Interactions Another benefit of the assistant director position has been the ability to begin developing processes to assist faculty in improving their computer-based assessment

practices. Onboarding of new faculty and supporting them as they transition to computer-based assessment historically has been managed through a community of practice model in which faculty have collaborated to share ideas and problem solve shared struggles. While this model served the CBTF during the initial years, with continued growth the community of practice model has become less successful. As an initial step towards developing faculty support, the assistant director has established periodic meetings with CBTF faculty to build relationships and also identify faculty needs. In preparation for future meetings and conversations with faculty that are more directed to exploring assessment practices, we have also begun developing white papers, summarizing research-based best practices for computer-based assessment [24], providing support to help faculty implement better assessments in the CBTF. Since almost every engineering student will test in the CBTF at least once, supporting faculty in developing effective assessment practices is a necessary service for the students, but one that could not be provided in the absence of an assistant director.

Each form of staffing; proctor, office support specialist, coordinator, and assistant director allows the CBTF to provide consistent and secure exams for over 50 courses each semester, while still maintaining an overall cost of approximately \$2 per exam [25]. Considering the expenses associated with administering a paper-based exam [8], our model still represents a more economical option with the added benefits of freeing faculty and course staff to engage students with other higher-impact activities instead of focusing on test administration logistics.

4 Dedicated Computer Labs

Considering how difficult it can be to acquire space on many campuses, it can be tempting to consider a shared-use model with existing computer labs, allowing a lab to be open for general use at some times and closed for computer-based assessment at other times. This was the model that we used when the CBTF was first introduced on campus, but the time and resources required by the IT department to transition it from an open lab to a secure testing environment made multiplexing unsustainable. Additionally, once established, demand for the CBTF quickly grew making it one of the highest utilized spaces on campus, eliminating the need and justification for the shared use model. This transition to dedicated computer labs for assessment has provided us with opportunities not available under a shared-use model.

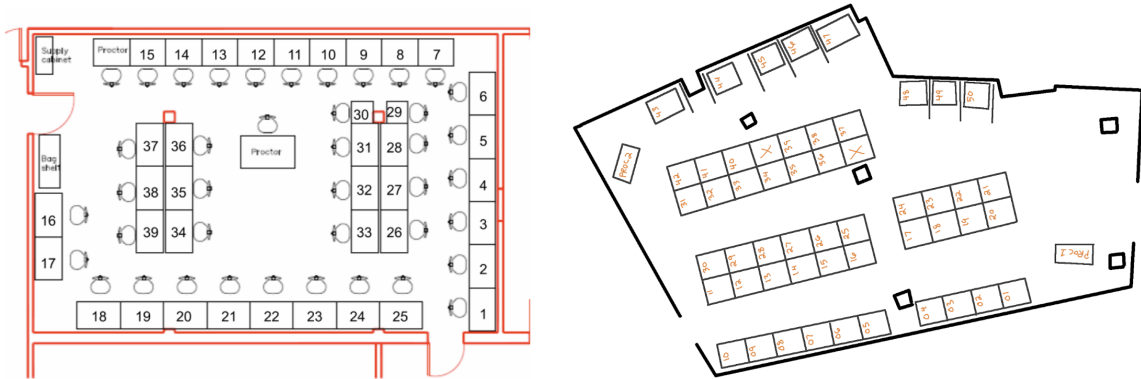
4.1 Lab Layout

A key advantage of having dedicated testing labs is that allows those spaces to be designed specifically for CBTF use. Early CBTF labs (see Fig. 3a) were often repurposed open-access labs and were designed around access to power and data rather than with the needs of a testing environment in mind. As we have developed new labs as dedicated spaces, we have been able to prioritize the specific needs of the CBTF:

- Sight lines - We consider visibility to proctors and security cameras when planning seating.
- Traffic flow - We plan how students will travel through the space to avoid congestion.
- Accessibility - Input from accessibility specialists is not only critical for ADA compliance, but it creates a space that is usable for all.

Lab	Testing Hours / Week	Weekly Proctoring Cost	Cost / Testing Hour
Lab 1 (33 seats)	1,617 testing hours / week	\$1,960 / week	\$1.21 / testing hour
Lab 2 (45 seats)	1,960 testing hours / week	\$1,960 / week	\$1.00 / testing hour
Lab 3 (83 Seats)	4,648 testing hours / week	\$2,240 / week	\$.48 / testing hour
Lab 4 (100 seats)	5,600 testing hours / week	\$2,240 / week	\$.40 / testing hour

- Testing accommodations - We collaborate with student disability resources to accommodate the needs of students as much as possible. Part of this entails designing a space that can meet common testing accommodations such as distraction-reduced or wheelchair-accessible seating.
- Utilization - We consider how we can maximize the utilization of the space to create the optimal capacity for testing



(a) Original CBTF Lab

(b) New CBTF Lab

Figure 3: CBTF Lab Layout Comparison

4.2 Lab Size

In addition to designing spaces better suited to administering exams, utilizing dedicated labs allows us to advocate for larger and more cost-effective spaces. In all of our labs, we utilize a two-proctor model regardless of the size of the lab. While our smaller labs could be managed by a single proctor, a second proctor is necessary to provide support if issues arise or to help provide consistent lab coverage if a proctor becomes sick or misses a shift. The effect of this is that small labs carry the same proctoring costs as larger labs. As demonstrated in the comparison of proctoring costs in the table below, the cost per testing hour for our smallest lab is approximately 300% higher in comparison to our largest lab.

Through the process of designing larger labs, we have also been able to identify 100 seats as the approximate maximum number of students that can be managed by two proctors. Beyond 100 seats, a third proctor becomes necessary to facilitate the check-in process in a timely manner and also for effectively monitoring students. Unfortunately, most existing computer labs on campus tend to be smaller and therefore less cost-effective.

5 Evolving CBTF Policies

As the CBTF has grown, we have also needed to adjust our lab policies. These policy changes have been made to increase exam security and also to improve the student experience while taking CBTF exams.

5.1 Lab Security Policy Changes

As we have discussed in previous publications, the CBTF is continually engaged in the process of developing policy intended to create a secure testing environment [7]. As figure 4a demonstrates, since 2018, less than .05% of testing reservations have resulted in actionable academic integrity violations. The low occurrence of cheating in the CBTF can be attributed to network-filtered computers and the trained proctors who enforce the numerous CBTF security measures such as (1) not allowing outside materials to be brought into the lab, (2) rotating the color of CBTF scratch paper for each exam session, (3) and disallowing access to electronic devices during exams.

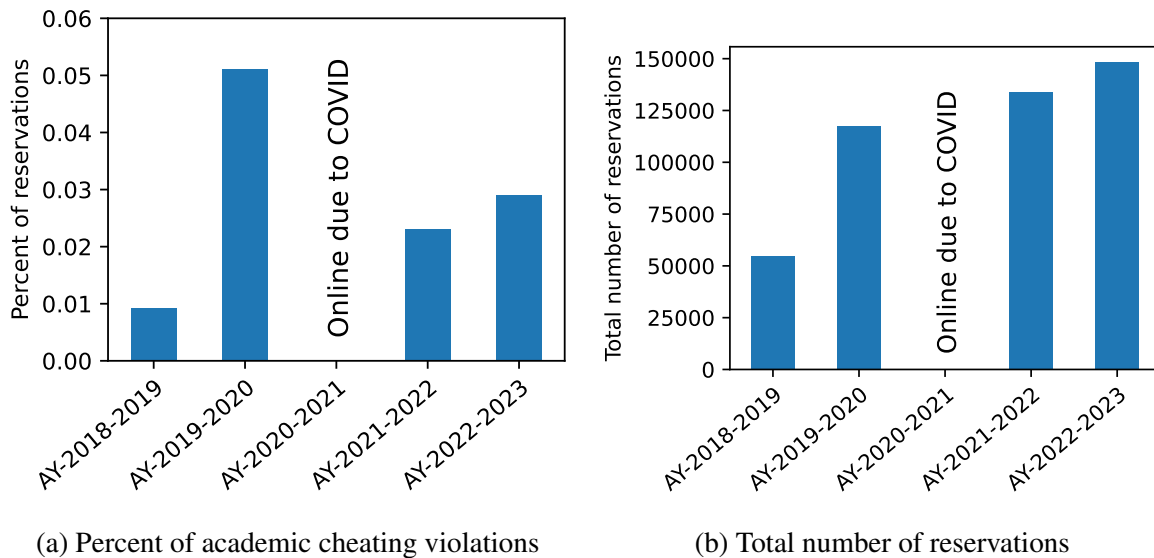


Figure 4: Record of Academic Integrity Violations

The vast majority of actionable academic integrity reports can be grouped into two categories; (1) using a cell phone or smartwatch during an exam or (2) bringing course material into the lab either in the form of a cheat sheet or written on their body. However, we have also seen other student behaviors develop which have required us to institute new exam policies. Restrictions regarding when students could begin writing on their scratch paper is a good example of a policy change that occurred in response to student behavior. Until recently, students were allowed to write on their scratch paper as soon as they were seated in the lab, a policy based on the assumption that once in the lab any information that was written on the scratch paper would be from student memory. However, some students recognized that the time between when they were seated and the start of the exam was a vulnerability because proctors were focused on checking students into the lab and were not able to monitor the room. Some students exploited this short window of time

by copying information from their phone or a cheat sheet onto scratch paper, creating the appearance that they had written the information from memory. Fortunately, due to reports of suspicious behavior during the check-in period from the CBTF proctors, we identified this behavior and adjusted our policy, no longer allowing students to write until the exam had started. This new policy allows proctors to better identify and report when students are attempting to use unauthorized materials to gain an advantage on their exam during the check-in period.

While most CBTF lab policies are focused on student activity in the lab, we recently were forced to evaluate our policy pertaining to bathroom use during exams. Our long-standing policy had been to permit students to use the restroom during an exam. However, after experiencing an increasing number of academic integrity violations related to students accessing materials outside of the exam rooms during these bathroom breaks, we were forced to change this policy. In response, we shifted to a policy in which for 50-minute exams, which represents over 90% of CBTF exams, students are permitted to use the bathroom but will not be allowed to re-enter the exam room to continue their exam. As depicted in Figure 5, this new policy has resulted in a more than an 80% reduction in the number of students who have exited the testing labs to use the bathroom during their exam, helping to provide a more equitable testing experience by ensuring that students all have access to the same information during an exam.

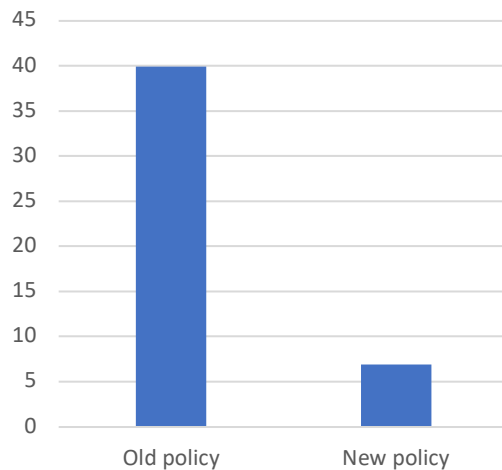


Figure 5: Bathroom Visits Per Week

We also work to proactively identify and prevent potential cheating vectors. Currently, we are testing a process for capturing images of students during check-in with the intent of preventing individuals from taking exams for other students. When implemented, as part of the check-in process, students will be photographed and our scheduling software will index each photo associated with a student's ID card which will all be visible to both students and proctors during check-in. We anticipate that this new process will make it easier for proctors to identify when a person attempts to take an exam in place of another student and also act as a deterrent for this behavior by making it visible to students that there is a photographic record of who has checked in for each exam.

5.2 Enhancing the Student Experience

Although most CBTF policy is focused on exam security, we are also sensitive to making policy changes that could enhance the student experience in the CBTF. An example of this is evident in the steps we have taken to serve students with documented testing accommodations by going beyond what is provided at official testing accommodation centers on campus. Standard practice is to provide noise-canceling earmuffs to students who require a distraction-reduced testing environment, but students shared that these earmuffs sometimes had the negative effect of increasing anxiety by amplifying the sound of their own breathing. To provide an alternative option, we installed background noise audio files (e.g. sounds of waves, rain, chimes, etc.) and provided headphones in our distraction-reduced seats. Based on the positive feedback, we are exploring how to provide these audio files and headphones to all students who test in our labs.

Additionally, we recently took steps to address student concerns pertaining to the calculator provided for CBTF exams. Due to security concerns, students are not permitted to use their personal calculators during exams. Instead, faculty have the option to provide computation resources through their learning management system or have students rely on the CBTF-provided calculator. However, in the past students and faculty expressed concerns that the CBTF-provided calculator was so antiquated that it was potentially negatively impacting student exam performance. We therefore engaged in a process of gathering student and faculty input to learn more about concerns and preferences. Based on this input, during Summer 2023, we replaced our existing calculators with TI-34 MultiView scientific calculators.

5.3 Course Scheduling Policy Changes

A final area of policy change involves the scheduling of course exams. As a new service offered on campus, the scheduling philosophy was built around a principle that prioritized incorporating new courses into the CBTF. That was useful for giving everyone who was interested some resources in the CBTF, but the policy also meant that returning courses may receive different quantities, duration, or spacing of exams in subsequent semesters. As the number of CBTF courses increased, prioritizing new courses began to negatively impact already established CBTF courses, primarily due to capacity-related constraints. Recognizing the effort that courses had invested in developing their computer-based assessments, we shifted our scheduling policy to prioritize courses that “have historically tested in the CBTF and who plan to utilize the same testing schedule (testing frequency, length of exams, week during the semester),” followed by returning courses requesting schedule changes, and finally admitting new courses based on remaining capacity. The goal of this policy was to provide stability for courses that had invested in adapting to computer-based assessment. This policy shift demonstrates the evolution in thinking from our "start-up" phase, which focused on getting the word out and attracting as many courses as possible to a more "stable" phase that provides a consistent service for courses across semesters.

In relation to exam scheduling, our policy on exam windows has also changed as we have come to better understand student scheduling behavior. During the first semesters of operation, courses were assigned 5-day exam windows, but our data showed approximately 80% of students,

regardless of the length of the exam window, would register on the last day of the exam. This data has impacted our scheduling in two ways. First, we now plan our scheduling to stagger the last day of exams, helping to ensure that students will have a sufficient number of open reservation slots. Additionally, we reduced our standard exam window to three days, with the exception being weekend exams which have four days to guarantee students at least two weekday options for taking their exams. Given new developments in our scheduling software and the ease with which courses can give extensions to manage conflict exams, we are now experimenting with a 2-day testing window.

6 Looking to the Future

As we look to the future with expansion already in progress and more courses from different disciplines likely to be transitioned to the CBTF, the next phase of our growth will focus on how to best support new faculty so that they and their students can experience the full benefits of computer-based assessment. To help provide the additional faculty support, especially for faculty who are not familiar with CBT or who do not have a strong background in coding, the College of Liberal Arts and Sciences created a Learning Design Specialist position. This person will be responsible for faculty onboarding, identifying good candidate courses for CBT, expanding CBT access to non-STEM courses, planning for growth within the college, assessing user satisfaction, and establishing guidelines for LAS courses that would like to test in the CBTF. The addition of this position is a recognition that what was once a process that depended on a small community of practice sharing insights with peer faculty members has grown more dynamic. While peer support will always be an integral part of teaching and assessment, the CBTF also bears a responsibility to develop processes that will help support faculty as they bring their assessments into the CBTF.

Additionally, our CBTF administrative team is increasingly contacted by other institutions to learn about our operations. To help improve our consistency and to also better enable us to share resources, we are in the process of developing an operations manual. This document will serve as an onboarding tool for new CBTF staff members and also as a guide for other institutions when developing their own testing facilities. While it is likely that our policies and practices will not transfer to all new contexts, this document will provide insight into what institutions should be considering and then adapting to fit their environment.

Finally, with the growing number of institutions that are interested in developing their own testing facilities, we find it important to initiate a consortium composed of the faculty and staff who oversee these facilities. A consortium of testing center administrators will contribute to developing a community of practice around testing center administration, leading to more robust sharing of information and tools, and also the development of best practices as institutions learn from and grow based on each other's experiences.

The CBTF at the University of Illinois at Urbana-Champaign has transformed how assessment at scale is conducted in the College of Engineering, facilitating the implementation of research-based pedagogical assessment practices that are improving student outcomes [10, 11]. We believe the lessons shared in this paper can serve as a template for other engineering programs about how to effectively provide CBT at scale in a manner that positively impacts students and

faculty.

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