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30. Case Study: Quantitative Learning Center at UConn

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1 Introduction

The University of Connecticut's Quantitative Learning Center (Q Center) is a resource to elevate the proficiency of students taking quantitative intensive (Q) courses across the undergraduate curriculum. The Q Center provides direct assistance to students via peer tutoring in most lower-level Q courses in math, chemistry, physics and statistics. It also assists faculty in incorporating best practices in their teaching and serves as a clearinghouse for information about Q resources and discussion of Q issues within the university. Additional information that supplements this case study is available at the Q Center's website: `http://qcenter.uconn.edu/`.

UConn is the state's flagship public research university, enrolling a total of about 30,000 students in a wide variety of programs across several campuses. In 2013, the main campus in Storrs had about 18,000 undergraduates; the number of entering freshmen was 3755, after many years of being around 3200, with occasional surges. The nature of the institution (large and research-focused in contrast to smaller or teaching-focused) leads to some noteworthy differences in the challenges faced by those running the Q Center, to be described in Section 6.

The need for a Q Center at UConn came out of general education requirements (from 2004) that all undergraduates pass at least 2 writing-intensive (W) courses and 2 quantitatively-intensive

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(Q) courses. University committees determine which courses qualify for the W and Q flags based on standard criteria. W courses must require students to produce and rewrite at least 15 pages and the course size is capped at 19 to allow instructors to give students more personal attention.

Q courses have no such cap and are frequently taught in large lectures of up to 350, sometimes (but not always) with smaller breakout recitations. The main litmus test for such courses is that (high-school) algebra is an integral part of the course and used throughout. Technology is explicitly mentioned as an allowable tool but not one that should substitute for understanding since merely feeding data into a canned program and reading the results is considered insufficient. More details are available at `http://geoc.uconn.edu/quantitative-competency`.

The new Q requirement expressly calls for the existence of a university-wide Q Center, which had not previously existed. A writing center *had* already existed as a unit of the College of Liberal Arts and Sciences (CLAS) (as at many colleges around the country). Starting in 2004, the Writing Center was organizationally relocated to become a university-wide unit, and the Q Center was created.

2 Center Organization & Services

The Q Center is part of UConn's Institute for Teaching and Learning (ITL), which provides various types of support for students and faculty. In the past, the head of ITL reported directly to the vice-provost for undergraduate education and instruction, who reported to the provost. More recently, an organizational change, merging ITL with the college of continuing studies and some other student support services, resulted in the creation of a Center for Excellence in Teaching and Learning thereby adding one more layer of administration. For simplicity, this report describes the Q Center as it existed from its inception in 2004 through 2012, during most of which time the author served as its director.

After the initial build-up, the core Q Center staff consisted of a director and associate director (each half-time), a part-time assistant director who mostly developed and maintained the IT infrastructure, and a program assistant who varied between half and 80% time. The director and associate director were also half-time tenure-track faculty members in the department of mathematics.

Q Center History

In its first year, 2004–05, the Q Center was run by interim-director Chuck Vinsonhaler, former math department head, who started a small peer-tutoring program. The author was hired as the first director in Fall 2005 and served until stepping down after the Fall 2012 semester. In Fall 2005, Christy Hilliard started as the first halftime program assistant. From the beginning, building a new unit, essentially from scratch, within a large research university posed many challenges. Finding

suitable spaces for activities, advocating for appropriate funding levels, and developing a strongly positive reputation each took a great deal of time and effort.

Early efforts focused on providing services to students, and the Center's peer-tutoring program turned out to be extremely popular, as shown in Figure 1. The number of visits to peer tutoring greatly increased each fall for the first five Fall semesters, forcing directors to scramble for more resources and to hire more tutors at the last minute. Eventually volume leveled off, but *actual* demand for services seems never to have declined. The decrease in volume in Fall 2011 is directly attributable to budget cuts that necessitated a decrease in the number of open hours and in the number of tutors on staff.

Figure 1: Q Center Visits & Staffing Over Time

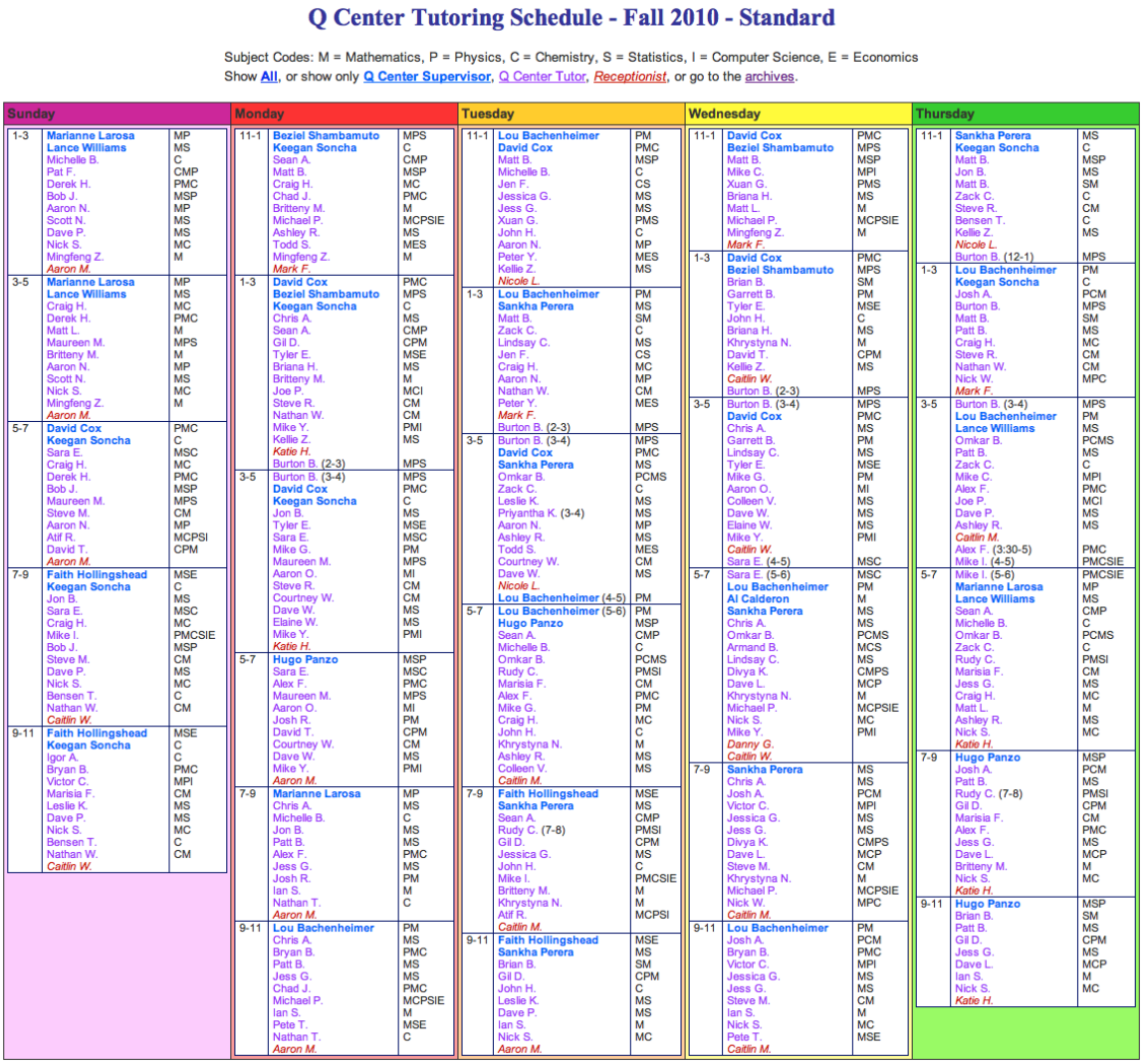
Term	# visits	# open hours	# tutors	# half GAs	# Entering Freshmen
Fall 05	600	20	10	6	3260
Spring 06	1200	28	14	13	
Fall 06	3906	40	30–40	12	3240
Spring 07	3866	50	45	11	
Fall 07	7000	58	40–55	13	3179
Spring 08	6550	58	55–60	17	
Fall 08	9279	58	60–80	13	3606
Spring 09	7895	58	80	13	
Fall 09	11,334	58	80–90	12	3221
Spring 10	8012	58	80–90	12	
Fall 10	10,457	58	70-75	12	3339
Spring 11	7949	53	70–75	12	
Fall 11	8638	44	65	12	3327
Spring 12	8494	44	65	12	
Fall 12	8772	44	55–60	10	3114

The term "GAs" refers to Graduate Assistants working as supervisors in the Q Center. GAs are generally hired from various Q departments, sometimes as half of their appointment (10 hours/week), sometimes as their full appointment (20 hours/week). The term "TA" refers to Teaching Assistants working within their own departments, not for the Q Center.

Peer Tutoring

The main service provided by the Q Center is *free, on-demand, drop-in* peer tutoring for many Q courses, particularly those taken by the majority of students to satisfy Q requirements. The center is typically staffed Monday–Thursday from 11a.m.–11.p.m. and Sunday 1–11p.m.. Occasionally, in lean budget years, the number of hours on Sundays and mornings might be reduced. At any given time there are typically 7–14 undergraduate tutors on duty, supervised by two graduate students (GAs) in Q departments. A glance at the schedule in Figure 2 helps to orient the reader to the

Figure 2: Q Center Tutoring Schedule, Fall 2010



Q Center Tutoring Schedule - Fall 2010 - Standard

Subject Codes: M = Mathematics, P = Physics, C = Chemistry, S = Statistics, I = Computer Science, E = Economics
Show All, or show only Q Center Supervisor, Q Center Tutor, Receptionist, or go to the archives.

Sunday

1-3	**Marianne Larosa**	MP
	Lance Williams	MS
	Michelle B.	C
	Pat F.	CMP
	Derek H.	PMC
	Bob J.	MSP
	Aaron N.	MP
	Scott N.	MS
	Dave P.	MS
	Nick S.	MC
	Mingfeng Z.	M
	Aaron M.	
3-5	**Marianne Larosa**	MP
	Lance Williams	MS
	Craig H.	MC
	Derek H.	PMC
	Matt L.	M
	Maureen M.	MPS
	Britteny M.	M
	Aaron N.	MP
	Scott N.	MS
	Nick S.	MC
	Mingfeng Z.	M
	Aaron M.	
5-7	**David Cox**	PMC
	Keegan Soncha	C
	Sara E.	MSC
	Craig H.	MC
	Derek H.	PMC
	Bob J.	MSP
	Maureen M.	MPS
	Steve M.	CM
	Aaron N.	MP
	Atif R.	MCPSI
	David T.	CPM
	Aaron M.	
7-9	**Faith Hollingshead**	MSE
	Keegan Soncha	C
	Jon B.	MS
	Sara E.	MSC
	Craig H.	MC
	Mike I.	PMCSIE
	Bob J.	MSP
	Steve M.	CM
	Dave P.	MS
	Nick S.	MC
	Bensen T.	C
	Nathan W.	CM
	Caitlin W.	
9-11	**Faith Hollingshead**	MSE
	Keegan Soncha	C
	Igor A.	C
	Bryan B.	PMC
	Victor C.	MPI
	Marisia F.	CM
	Leslie K.	MS
	Dave P.	MS
	Nick S.	MC
	Bensen T.	C
	Nathan W.	CM
	Caitlin W.	

Monday

11-1	**Beziel Shambamuto**	MPS
	Keegan Soncha	C
	Sean A.	CMP
	Matt B.	MSP
	Craig H.	MC
	Chad J.	PMC
	Britteny M.	M
	Michael P.	MCPSIE
	Ashley R.	MS
	Todd S.	MES
	Mingfeng Z.	M
	Mark F.	
1-3	**David Cox**	PMC
	Beziel Shambamuto	MPS
	Keegan Soncha	C
	Chris A.	MS
	Sean A.	CMP
	Gil D.	CPM
	Tyler E.	MSE
	Briana H.	MS
	Britteny M.	M
	Joe P.	MCI
	Steve R.	CM
	Nathan W.	CM
	Mike Y.	PMI
	Kellie Z.	MS
	Katie H.	
	Burton B. (2-3)	MPS
3-5	Burton B. (3-4)	MPS
	David Cox	PMC
	Keegan Soncha	C
	Jon B.	MS
	Tyler E.	MSE
	Sara E.	MSC
	Mike G.	PM
	Maureen M.	MPS
	Aaron O.	MI
	Steve R.	CM
	Courtney W.	CM
	Dave W.	MS
	Elaine W.	MS
	Mike Y.	PMI
	Katie H.	
5-7	**Hugo Panzo**	MSP
	Sara E.	MSC
	Alex F.	PMC
	Maureen M.	MPS
	Aaron O.	MI
	Josh R.	PM
	David T.	CPM
	Courtney W.	CM
	Dave W.	MS
	Mike Y.	PMI
	Aaron M.	
7-9	**Marianne Larosa**	MP
	Chris A.	MS
	Michelle B.	C
	Jon B.	MS
	Patt B.	MS
	Alex F.	PMC
	Jess G.	MS
	Josh R.	PM
	Ian S.	M
	Nathan T.	C
	Aaron M.	
9-11	**Lou Bachenheimer**	PM
	Chris A.	MS
	Bryan B.	PMC
	Patt B.	MS
	Jess G.	MS
	Chad J.	PMC
	Michael P.	MCPSIE
	Ian S.	M
	Pete T.	MSE
	Nathan T.	C
	Aaron M.	

Tuesday

11-1	**Lou Bachenheimer**	PM
	David Cox	PMC
	Matt B.	MSP
	Michelle B.	C
	Jen F.	CS
	Jessica G.	MS
	Jess G.	MS
	Xuan G.	PMS
	John H.	C
	Aaron N.	MP
	Peter Y.	MES
	Kellie Z.	MS
	Nicole L.	
1-3	**Lou Bachenheimer**	PM
	Sankha Perera	MS
	Matt B.	SM
	Zack C.	C
	Lindsay C.	MS
	Jen F.	CS
	Craig H.	MC
	Aaron N.	MP
	Nathan W.	CM
	Peter Y.	MES
	Mark F.	
	Burton B. (2-3)	MPS
3-5	Burton B. (3-4)	MPS
	David Cox	PMC
	Sankha Perera	MS
	Omkar B.	PCMS
	Zack C.	C
	Leslie K.	MS
	Priyantha K. (3-4)	MS
	Aaron N.	MP
	Ashley R.	MS
	Todd S.	MES
	Courtney W.	CM
	Dave W.	MS
	Nicole L.	
	Lou Bachenheimer (4-5)	PM
5-7	**Lou Bachenheimer** (5-6)	PM
	Hugo Panzo	MSP
	Sean A.	CMP
	Michelle B.	C
	Omkar B.	PCMS
	Rudy C.	PMSI
	Marisia F.	CM
	Alex F.	PMC
	Mike G.	PM
	Craig H.	MC
	John H.	C
	Khrystyna N.	M
	Ashley R.	MS
	Colleen V.	MS
	Caitlin M.	
7-9	**Faith Hollingshead**	MSE
	Sankha Perera	MS
	Sean A.	CMP
	Rudy C. (7-8)	PMSI
	Gil D.	CPM
	Jessica G.	MS
	John H.	C
	Mike I.	PMCSIE
	Britteny M.	M
	Khrystyna N.	M
	Atif R.	MCPSI
	Caitlin M.	
9-11	**Faith Hollingshead**	MSE
	Sankha Perera	MS
	Brian B.	SM
	Gil D.	CPM
	John H.	C
	Leslie K.	MS
	Dave P.	MS
	Ian S.	M
	Nick S.	MC
	Aaron M.	

Wednesday

11-1	**David Cox**	PMC
	Beziel Shambamuto	MPS
	Matt B.	MSP
	Mike C.	MPI
	Xuan G.	PMS
	Briana H.	MS
	Matt L.	M
	Michael P.	MCPSIE
	Mingfeng Z.	M
	Mark F.	
1-3	**David Cox**	PMC
	Beziel Shambamuto	MPS
	Brian B.	SM
	Garrett B.	PM
	Tyler E.	MSE
	John H.	C
	Briana H.	MS
	Khrystyna N.	M
	David T.	CPM
	Kellie Z.	MS
	Caitlin W.	
	Burton B. (2-3)	MPS
3-5	Burton B. (3-4)	MPS
	David Cox	PMC
	Chris A.	MS
	Garrett B.	PM
	Lindsay C.	MS
	Tyler E.	MSE
	Mike G.	PM
	Aaron O.	MI
	Colleen V.	MS
	Dave W.	MS
	Elaine W.	MS
	Mike Y.	PMI
	Caitlin W.	
	Sara E. (4-5)	MSC
5-7	Sara E. (5-6)	MSC
	Lou Bachenheimer	PM
	Al Calderon	M
	Sankha Perera	MS
	Chris A.	MS
	Omkar B.	PCMS
	Armand B.	MCS
	Lindsay C.	MS
	Divya K.	CMPS
	Dave L.	MCP
	Khrystyna N.	M
	Michael P.	MCPSIE
	Nick S.	MC
	Mike Y.	PMI
	Danny G.	
	Caitlin W.	
7-9	**Sankha Perera**	MS
	Chris A.	MS
	Josh A.	PCM
	Victor C.	MPI
	Jessica G.	MS
	Jess G.	MS
	Divya K.	CMPS
	Dave L.	MCP
	Steve M.	CM
	Khrystyna N.	M
	Michael P.	MCPSIE
	Nick W.	MPC
	Caitlin M.	
9-11	**Lou Bachenheimer**	PM
	Josh A.	PCM
	Bryan B.	PMC
	Victor C.	MPI
	Jessica G.	MS
	Jess G.	MS
	Steve M.	CM
	Ian S.	M
	Nick S.	MC
	Pete T.	MSE
	Caitlin M.	

Thursday

11-1	**Sankha Perera**	MS
	Keegan Soncha	C
	Matt B.	MSP
	Jon B.	MS
	Matt B.	SM
	Zack C.	C
	Steve R.	CM
	Bensen T.	C
	Kellie Z.	MS
	Nicole L.	
	Burton B. (12-1)	MPS
1-3	**Lou Bachenheimer**	PM
	Keegan Soncha	C
	Josh A.	PCM
	Burton B.	MPS
	Matt B.	SM
	Patt B.	MS
	Craig H.	MC
	Steve R.	CM
	Nathan W.	CM
	Nick W.	MPC
	Mark F.	
3-5	Burton B. (3-4)	MPS
	Lou Bachenheimer	PM
	Lance Williams	MS
	Omkar B.	PCMS
	Patt B.	MS
	Zack C.	C
	Mike C.	MPI
	Alex F.	PMC
	Joe P.	MCI
	Dave P.	MS
	Ashley R.	MS
	Caitlin M.	
	Alex F. (3:30-5)	PMC
	Mike I. (4-5)	PMCSIE
5-7	Mike I. (5-6)	PMCSIE
	Marianne Larosa	MP
	Lance Williams	MS
	Sean A.	CMP
	Michelle B.	C
	Omkar B.	PCMS
	Zack C.	C
	Rudy C.	PMSI
	Marisia F.	CM
	Jess G.	MS
	Craig H.	MC
	Matt L.	M
	Ashley R.	MS
	Nick S.	MC
	Katie H.	
7-9	**Hugo Panzo**	MSP
	Josh A.	PCM
	Patt B.	MS
	Rudy C. (7-8)	PMSI
	Gil D.	CPM
	Marisia F.	CM
	Alex F.	PMC
	Jess G.	MS
	Dave L.	MCP
	Britteny M.	M
	Nick S.	MC
	Katie H.	
9-11	**Hugo Panzo**	MSP
	Brian B.	SM
	Patt B.	MS
	Gil D.	CPM
	Jess G.	MS
	Dave L.	MCP
	Ian S.	M
	Nick S.	MC
	Katie H.	

scope of the operation. GAs, "Q Center Supervisors", are listed by their full names at the top, tutors by first name and last initial, followed by the receptionist on duty. Color versions of this schedule for various semesters are available on the website (in the "archives" section) and display snapshots of the overall operation as it changes over time.

Although frequently requested, the center never offers one-on-one tutoring. Instead, tutors roam from student to student, provide bursts of assistance, and allow tutees to ponder the problem in between. Tutors are trained to avoid holding a pencil, as much as possible, and to provide encouragement with a minimum of hints, enabling students to reach a solution with as much independence as possible. It is made clear to tutors and students that this method will generally facilitate the greatest learning for the students, who do not have tutors to help them during exams.

The exemplary practices of UConn's Writing Center provide a useful comparison and contrast.

Students seeking help with their writing, typically a term paper, schedule a one-on-one appointment and bring a draft for discussion with the tutor. A student might do this once or twice a semester, and the atmosphere tends to be rather relaxed, like meeting a friend in a coffee shop.

By contrast, Q tutoring has an atmosphere more like an emergency room, with often-nervous students arriving for last-minute help on homework or on imminent exams. The supervisors and receptionists triage students to appropriate tutors in an attempt to balance the load. Most tutors can tutor for multiple subjects, so fewer tutors are needed to staff the Center at any one time while meeting the variety of demand distributions that arise during the semester. A fuller comparison of the different tones of the Q and Writing Centers is presented in [1].

Many visitors return, with the average tutee making about five visits to the Center. Some students sit in or near the Center, work on assignments, and request help as needed. Sometimes tutors encourage students to form study groups, and when a large number of students arrive for the same course, the individual tutoring sessions often transform into an impromptu small recitation.

Physical Locations & Learning Commons

As the Center grew, peer-tutoring happened in a variety of shared spaces, including the director's office, a small classroom, and after hours in a dining hall. Locating dedicated space in a large university with many competing demands was extremely difficult, so the Center made do with what was available. But then opportunity knocked.

Like its peers, the UConn library observed a rapidly diminishing demand for its onsite services. As print reference materials and journals moved online, the library faced a surplus of space but a shortage of patrons. In an effort to attract more students, the librarians created a *Learning Commons* on a floor formerly occupied by printed journals and reference materials. Ideally students would find the new space inviting for study alongside academic resources.

The recently-renamed *Homer Commons* now houses a large number of workstations and small "studios" for group work, as well as centers to help students with Q and W subjects, foreign languages, and computer issues. The Q Center began moving into the Commons in Fall 2006 and, by Fall 2009, all of its tutoring operations were consolidated in that one location. Because there were no physical walls in the assigned area, the Center could grow somewhat as tutoring volume increased. This was mutually beneficial because the visitors for Q tutoring, the "anchor" for the learning commons, give a large boost to the library's headcount. A map and more details on Homer Commons is available at: `http://homercommons.uconn.edu/`.

The Center's furniture supports its model of tutoring. Although some of the tables are of normal height, most are at a comfortable height for people to stand around. The task chairs that surround the tables have adjustable heights within a range from low to high. This makes it easier for the tutors to move around between the students whom they are assisting without the extra burden of

sitting down and standing up or the strain of bending over students sitting at lower desks. All of the tables are small and move easily in contrast to most of the older, massive tables common in the library.

In the early years, the layout of tables defined the Center's space, and some people preferred a more flowing floor plan between different areas in the Commons. A significant number of students started arriving for tutoring help without signing in; this was problematic both for the accuracy of assessment and for providing correct numbers to the upper administration for justifying budget requests. Consequently, the Center's borders are defined by retractable tape barriers of the sort used to regulate queues. When the tutoring center is closed, the tape is retracted so that students may use the space freely for other purposes.

Workshops for Students

Different models for workshops aimed at students in Q courses were tried over the years, but attendance was generally poor. Students appear very fond of the individualized, on-demand attention they get from peer tutors and far less interested in sessions scheduled at particular times, which may strike them as similar to regular classes. However, the Center runs many successful workshops, given by a GA or instructor with a strong reputation, right before an exam.

IT infrastructure

As the Center grew so did the need to create IT solutions to help manage and assess center operations. GA Marc Corluy, hired in Fall 2006 to do extensive work on the public website, dramatically improved the reliability and flexibility of its infrastructure. Stylistic considerations are now relegated to one file in which one simple change modifies all of the pages on the site. Information that needs to appear in multiple places is stored in a MySQL database; as information changes, it only needs to be updated in one place, eliminating the common problem of conflicting information on different pages within one website.

Over several years, Marc and his successor, John Baber, created a number of tools that improved the quality of the public website including:

- various displays of tutor availability and expertise;
- the "tutoring by topic" function, which allows students to see the availability of tutoring on specific topics, e.g., "optics" is a topic within physics that few tutors know well; students looking for help on optics can filter the tutoring schedule by this topic; and
- lists of all Q courses, organized in various ways (e.g., by department), and notations as to whether tutoring is available "always", "never", or "sometimes" (when knowledgeable tutors are on duty and the center is not too busy).

The public site also includes an FAQ page, links to online resources, and a list of private tutors for hire.

However, the lion's share of improvements, created to streamline the Center's administrative and data gathering procedures, are housed on a private, secure section of the website only available to Q Center administrators. The online features that make it possible to run such a large tutoring operation with only a part-time program assistant include the following.

- A timecard system for tutors, who log in at the start of and log out at the end of their shifts. The online system replaced an error prone and labor-intensive paper system. All calculations are done through web-programming, reducing the human operations until the unavoidable manual transfer of data into arcane university systems.

  Corollaries of the above system include specific tools to track tutor absences, to track number of hours worked by a specific tutor within the academic year (primarily to manage work-study limitations), and to compare the average number of tutor-hours per week across different semesters.

- Tools for tutors to input their availability and for Center administrators to easily create a balanced schedule, covering all core subject areas with sufficient tutors to meet expected demand. Previously, creating this schedule by hand used to take a week, now it only takes a couple of days.

- Tools to track and analyze tutor evaluations and the number of visits, described in Section 5.

3 Staffing, Hiring, and Training

In a center of this size, the bulk of Q Center tutoring is done by undergraduates, while the administrators spend a good deal of time hiring, training, and evaluating workers.

Hiring & Recruitment

Students interested in becoming peer tutors complete an online application asking them to submit an (unofficial) transcript, some basic personal information, details of any previous tutoring experience, a list of courses they feel comfortable tutoring, and the name and email of a faculty reference. Tutors are required to have a minimum GPA of 3.4 overall and 3.5 in Q subjects. The application is available at `http://qcenter.uconn.edu/apply-to-be-a-q-center-tutor/`.

Directors call in for an interview those students with strong transcripts in areas of current need to assess their interpersonal skills and their ability to explain something technical. The interview is typically conducted by the associate director or an experienced GA. All of these filters are useful in maintaining a high level of quality among the tutors.

In the first few years, the directors asked faculty in Q disciplines to recommend that their best students consider applying to work as a Q Center tutor. Once the Q Center developed a reputation as a good place to work, word-of-mouth became the most effective recruitment tool. Retention levels are high, though some tutors are lost to other desirable positions such as ones involving research.

Good GAs are retained as many semesters as possible, but typically there are openings to fill each spring semester for the following academic year. Positions are filled through an open search but also in consultation with liaisons in each of the four most important Q departments, Mathematics, Chemistry, Physics, and Statistics, who help identify good candidates. All GA applicants provide a resumé and transcript and are interviewed by the directors.

Tutor training programs

To provide a more intensive training program than just occasional workshops, the associate directors created and regularly teach a 1-unit interdisciplinary course "Methods of Q Tutoring." All tutors who complete this course receive a salary raise of $1/hour. Participants read and discuss literature about effective tutoring and engage in a variety of activities such as role-playing. In more recent years the tutors have made training videos on models of good and poor tutoring practices and explanations of particularly tricky Q topics that frequently arise.

In addition, a number of training sessions, open to all current tutors, are offered including workshops on specific content areas which need the most review such as infinite series, combinatorics and discrete probability, and Gaussian elimination. The instructors aim to give the tutors some perspective on the material, not just to explain it at the level they will tutor. For example, the workshop on probability covers multiple ways of solving problems, some based more on elementary counting, others on leveraging probabilistic insights.

4 Community Interactions

Although peer tutoring provides the most common form of interaction between the Q Center and the UConn community, there are other interactions as well.

Work with Faculty

While the Q Center's mission includes working with instructors in Q disciplines, the demands of coordinating the peer-tutoring program leaves the directors little time to work systematically in this direction. Also, there has been little overt demand from Q instructors for this service. Such interactions have so far been mostly one-on-one meetings with a few faculty regarding specific requests, along with occasional one-off lectures on topics such as how to use clickers. Occasionally

opportunities arise for giving feedback to departments about particular courses such as when the Center experienced unexpected surges in student demand or tutoring staff reported some course-specific issue.

Relationship with other tutoring resources

Although the remarkable increase in volume of visits showed that there was a very large latent demand for tutoring in Q subjects when the Q Center was founded, there were already some tutoring resources on campus. Q departments tended to have small tutoring centers, staffed by some of their TAs, which handled a much smaller volume of traffic, less than 10% of the Q Center's steady-state. Possible reasons why the Q Center is so much more successful at attracting students and repeat customers include the following.

- The Q Center is spacious and conveniently located in the heart of campus, whereas departmental tutoring is often housed in small rooms which quickly become overcrowded.
- The Q Center's extensive number of open hours (including late into the evening) and drop-in availability have wide appeal unlike departmental tutoring which is largely limited to daytime hours.
- Departmental tutors are recruited from the same pool of TAs as those teaching recitations and are brought into their departments based on their research potential rather than teaching excellence. Students may already be unsatisfied with explanations provided by their TAs and appreciate the perspective of a fellow student, one whose struggles with particular topics are fresher and likely more substantial.
- The budget for departmental tutoring is usually a much lower priority than other needs of the departments such as research.

The key difference between departmental and Q Center tutoring is one of mission: at a public research institution, with high aspirations, research and grants are weighted most strongly in the evaluation of departments and faculty. This affects everything from budgetary priorities to hiring and graduate admissions. Consequently, teaching is not particularly important or rewarded beyond a certain minimum standard.

By contrast, funding for the Q Center comes from a separate budgetary stream, one designated to support student learning in undergraduate education. For the Q Center, the important metrics are the numbers of students served and the quality of those services, for which the IT infrastructure provides excellent data. As such, the Center has generally been able to get funding to meet the latent demand and to prioritize the quality of learning. This mission was essential to the Center's rapid growth.

Networking, Reputation, and Esprit de Corps

The intangible aspects of leadership should also be mentioned. In the early years, the director worked to develop strong ties with Q departments and with the wide variety of other units that provide support for teaching and learning throughout the University. The time and energy put into building those relationships often paid off when an informal conversation could lead to a significant synergy later on.

For example, upon the director's arrival, there was a small pre-existing tutoring program funded through Residence Life and administered through the Institute for Student Success. Through various conversations, it became clear that the Q Center was better equipped to hire and train quality tutors; so the Institute and Residential Life funded the Center to provide tutoring in one of the dining halls. This helped extend the Center's reach in the early years while building its reputation. This program continued until Residential Life was forced to cut funding for tutoring because of a large systemic budget shortfall.

The development of the Center's reputation over time was made clear by a conversation with an advisor from UConn's Academic Center for Exploratory Students, which handles advising for students who have yet to pick a major. In the first couple of years, when talking to students who came in with low Q placement, she would say, "I'm not sure, but you might want to try going to the Q Center for tutoring." A couple of years later she would say unequivocally, "Go to the Q Center!"

The Q Center endeavors to create a community of teachers and learners at every level. Listening to tutors and ensuring their efforts are acknowledged and appreciated is important to getting their best efforts. The importance of treating everyone with respect is a lesson regularly communicated to tutors and GAs. Occasional breaches of respect, sometimes detailed by student complaints, are highlighted in various tutor training meetings to good effect. The esprit de corps among Q tutors is clear from their interactions with the directors and each other. They are quick to point out issues that they see and suggest solutions for any problems that come up.

5 Assessment

Data Gathering & Analysis

In order to assess the Center's work, the directors gather significant amounts of data regarding students served and the quality of tutoring. Initially, visitors signed in on sheets of paper, but the data entry and analysis was time-consuming and only available for time periods significantly in the past. As introduced in Subsection 2, the IT infrastructure includes an online sign-in system which allows the tracking of individual students who visit the Center.

Tutees provide their demographic information only on the first visit each semester; on later visits they are asked different sets of questions regarding the quality of their previous visit to Q tutoring or their experience in their current Q course. Various tools allow the directors to run real-time reports on the data, disaggregating visits by course, department, gender, ethnicity, time period within the semester, etc. Side-by-side comparisons of the week-by-week visitor numbers for two different semesters (broken down by discipline) are particularly helpful.

These reports are of great use in evaluating the quality of peer tutoring. In the past, the average rating of tutees previous experiences dropped during periods when the Center's budget and hiring had not yet caught up to demand. Such data provided evidence to build a strong case for additional resources.

In addition to quantitative data, qualitative data, in the form of student comments solicited through the online system, proves quite informative. The qualitative data may be categorized broadly into positive comments (sometimes praising a particular tutor), negative comments, and the number of requests for more tutors, as in the table below.

Term	# visits	# tutors	#half GAs	#Pos	#Neg	#More tutors
Fall 08	9279	60–80	13	14	12	40
Spring 09	7895	80	13	23	4	25
Fall 09	11,334	80–90	12	24	12	123
Spring 10	8012	80–90	12	13	4	93

Evaluation & Management

Besides quantitative measures, the directors receive weekly feedback from the GA supervisors about how things are going in the Center. GAs meet regularly as a group with the directors and program assistant to discuss recent issues and possible solutions. Problems with individual tutors sometimes require a director's intervention. Issues with courses or homework sometimes call for a delicate discussion with a professor teaching a course. Data culled for specific courses using the online tools provides objective feedback for discussions with TAs or faculty from that discipline. A large increase in the volume of visitors for a particular course often points to a change in textbook, of professor, or a move to online homework.

Since the database can be queried in real time, directors can see the current state of tutoring such as the list of visitors (by their NetID's) and tutors who are signed in. When the Center unexpectedly receives higher tutee volume than it can handle, a director can send a general announcement to tutors asking for additional help from those willing to take on an extra shift.

Additional online tools include one that allows GAs to evaluate each of the tutors on their shifts and one that allows tutors to evaluate the GAs who supervise them. These evaluations take place at the end of each semester and are only seen by the directors who use them to make personnel

decisions. In the aggregate, these can also indicate whether any training or intervention might be called for. Later on, the evaluations form the basis of letters of recommendation written by the directors when tutors apply to graduate schools or for jobs.

In addition to seeking qualitative comments, the evaluation requests that respondents provide numerical rankings on a five-point scale for each of the following categories: professionalism, attendance, knowledge, behavior, and attitude. Tutors and GAs receive email reminders (the first few are automatically generated) until they fill them out. The rankings for each tutor (or GA) are summarized in a table, along with all the specific comments made about that person.

Between the online database, analytic tools, and the constant communication between GAs and administrators, the directors are able to keep a good handle on day-to-day Q Center operations. Unfortunately, the directors did not solicit an outside evaluation during the 5th or 6th year of the Center's operation. In addition to aiding the directors' long-term strategic thinking, the external validation would likely have been helpful in convincing newly appointed upper administrators of the quality of the Center's work. While, the writing center did organize an outside evaluation to good effect, at that time, it was somewhat harder to organize an outside evaluation for the Q Center because there was little to no intercollegiate infrastructure and communication between Q directors in different locations. (Something this Handbook is taking the lead in addressing.)

6 Additional Topics

Research in Q education

The directors had hoped to eventually leverage the Center as a possible lab for research in Q learning, taking advantage of the confluence of GAs from different disciplines, the large number of students taking courses that are fairly standard across the country, and the robust systems for gathering and analyzing data. It seemed likely that the directors could obtain extramural funding to support such research after meeting the hurdles of the Institutional Review Board, etc. Unfortunately, just as it became possible to take on the project, there was a change in the upper administration and the Center was expressly forbidden to do such research (under the rationale that Undergraduate Education and Instruction should not be supporting research). A couple of years later, that decision was reversed after another change in the upper administration. But at the time of the initial mandate, directors were left to redirect all of their research efforts solely into disciplinary work within mathematics.

Split positions

The Q directors' positions are split 50-50 between an administrative role in the Center and a tenure-track faculty role in the department. This split has a number of advantages. Faculty can

talk as peers with faculty from other departments, and they can exert some influence to improve the teaching structures within their departments based on their experience with the Center.

On the other hand, the split positions have led to serious evaluation issues for the faculty in these roles. In theory, the directors should be evaluated half on their administrative skills and the success of the Center and half on the usual mix of research, grants, teaching, and service (which at UConn is weighted much more heavily towards the first two). But, in practice, Q Center directors are held to the same standards for PTRM (Promotion, Tenure, Retention, & Merit) as faculty who serve full-time in the department. The associated course release (1 course per semester) directors receive is typically far less time and effort than the amount needed to keep the Center running smoothly.

7 Bibliography

[1] T. Deans and T. Roby, "Learning in the commons," *Inside Higher Ed*, November 2009.

8 Acknowledgments

The author is extremely grateful to all of the people who work so hard within the Q Center. In particular Álvaro Lozano-Robledo, who arrived as associate director in 2008 and continues now as director, has made a lasting impact on the center and the lives of many students. He was ably preceded by Kristen Sellke (2007–08) and Sarah Frey (2006–07), who started and maintained many initiatives during their too-brief tenures.

The author would have been lost at the beginning without the first permanent program assistant, Christy Hilliard. Her detailed knowledge of UConn's administration and ability to create new infrastructure as well as her dedication and reliability were outstanding. As she memorably put it: "We arrived to a kitchen with a small microwave and some paper plates, which we then had to transform into a functioning restaurant kitchen." She and her successor Diane Briody both have an excellent way of connecting with tutors and GAs that makes all the difference.

Of course the tutors and GAs, too numerous to mention (but still enshrined in the website's archives), are the ones in the trenches. Most of them do fantastic work, worthy of much higher pay than they receive. But there are other rewards.

Among the many administrators who made things happen, former vice-provost for Undergraduate Education & Instruction Veronica Makowsky deserves considerable kudos. Although her speciality in English was far from Q, she understood the importance of the work and how to support it. Her vision, caring, and advocacy on behalf of undergraduates leaves a continuing legacy. My immediate supervisor in ITL, Keith Barker, was also an excellent source of information, advice, and humor even in the face of the high bureaucratic viscosity typical of large public institutions.

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