Colket Center for Academic Excellence – The Quantitative Reasoning Center (QRC); Tutoring Practices and Patterns, AY13-14

Overview

In the academic year 2013-2014 (AY13-14), the Quantitative Reasoning Center (QRC) at Colorado College saw a substantial increase in requests and uses of QRC resources in several regards. Increases in all categories include 1) drop-in appointments at the QRC, 2) Learning Assistant appointments, 3) requests for individual tutoring (i.e., one-on-one), and 4) collaboration with college faculty and students in teaching and research. In addition, QRC Director Steve Getty has developed the tutor training program to support more common tutoring practices across subjects, and begun an evaluation program for QRC services. These services are described AY13-14 in the following sections:

1. QRC Drop-in Tutoring
2. The QRC Learning Assistant (LA) Program
3. QRC Individual Tutoring (i.e., One-on-one Tutoring)
4. Supporting Activities of the QRC Director
5. Summer Use
6. QRC Program Evaluation

1. QRC Drop-in Tutoring

Patterns of QRC drop-in tutoring over the past 3 academic years are shown in the graph below (Figure 1). During the academic year 2013-2014, a minimum of 1,785 students were recorded during drop-in hours at the QRC, and about 545 individual users. Compared with the average for the previous 2 academic years, this represents an increase in use of drop-in services of about +54%.

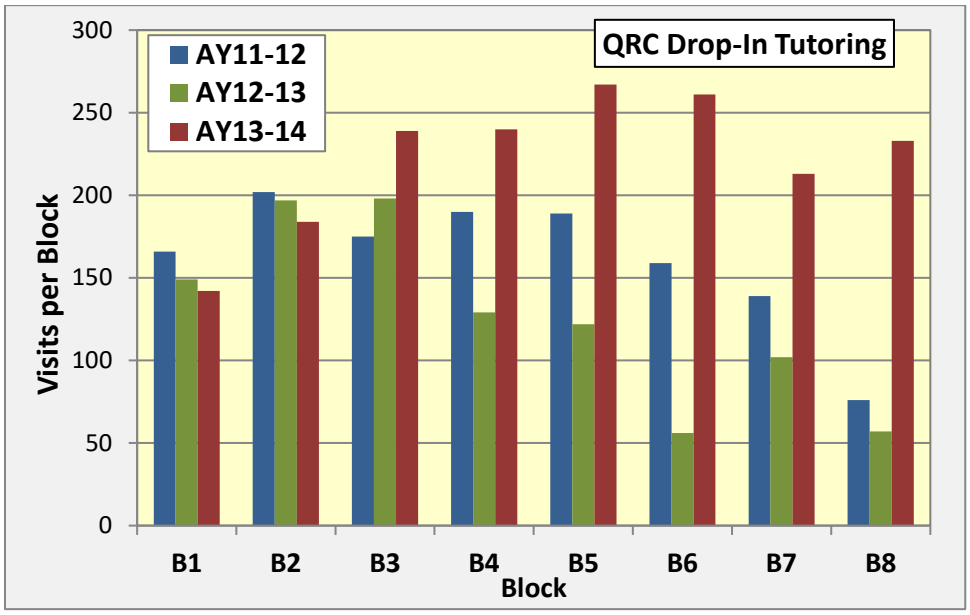

Figure 1. QRC Drop-in Tutoring, 2011-2014

Disciplinary support was most frequent for QRC drop-in tutoring in Mathematics, with Physics and Chemistry also having heavy use (Figure 2). This is broadly consistent with past patterns of QRC drop-in tutoring. A difference in the past year was an increased use of QRC tutors for Economics and Education courses.

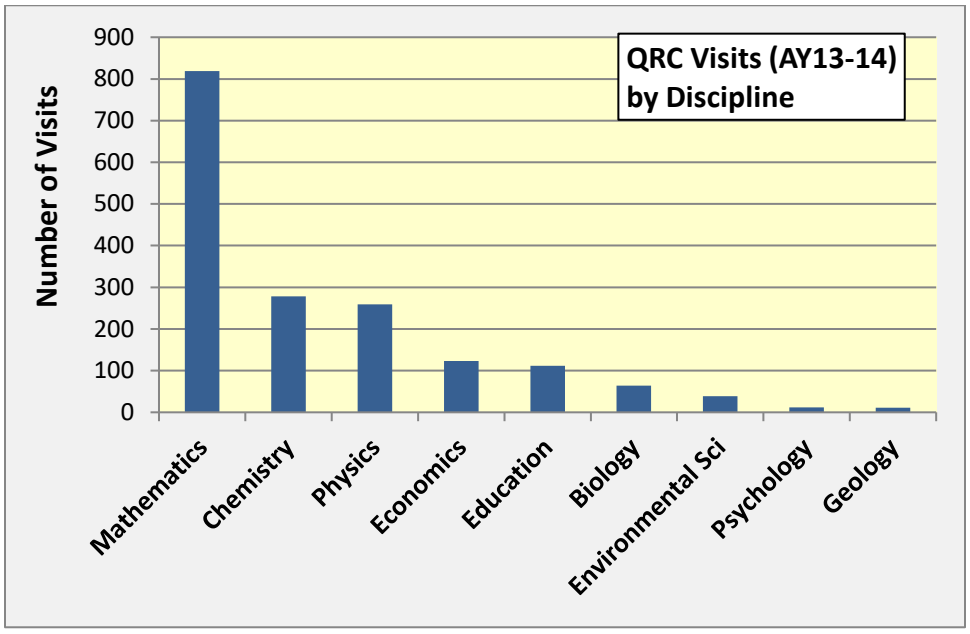

Figure 2. QRC Drop-in Tutoring by Department, AY2013-2014

Data from AY13-14 indicate that QRC drop-in tutoring is most heavily used by first-year and sophomore students. This is largely when students in science majors, on average, work to complete important requirements for their major.

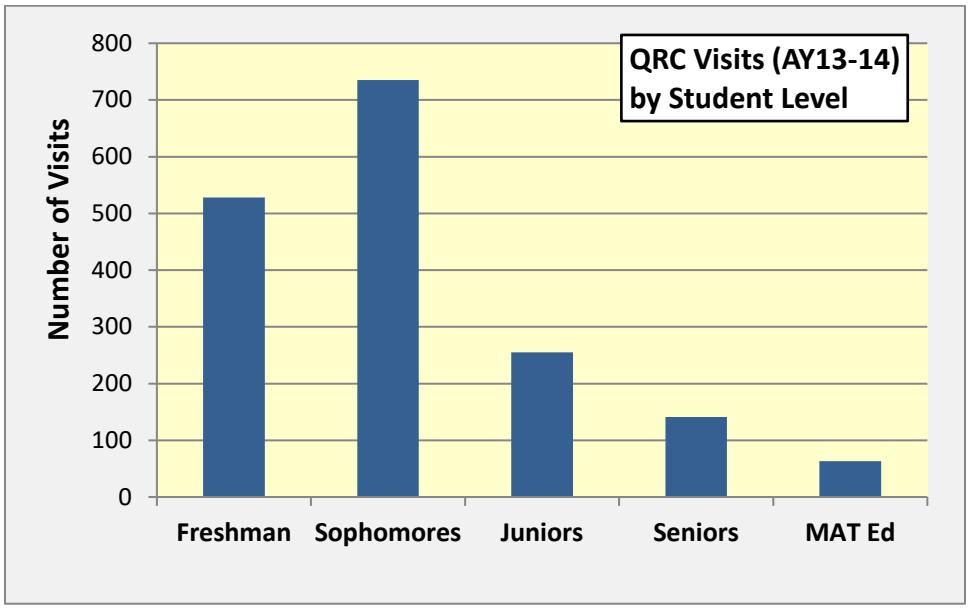

Figure 3. QRC Drop-in Tutoring by Student Year, AY2013-2014

2. The QRC Learning Assistant (LA) Program

The Learning Assistant Program (LA) is a growing element of student support at Colorado College. The increase in assigned Learning Assistants (LAs) the past 7 academic years is shown in Figure 4. In AY13-14, LAs were distributed relatively evenly among Mathematics, Chemistry, Psychology, and Biology. The average amount of time spenting tutoring as an LA was about 17 hours per course. Time tends to be split evenly among working with individual students, small groups, or most/all of the class. In those settings, LAs focus on study/homework sessions and prep for exams.

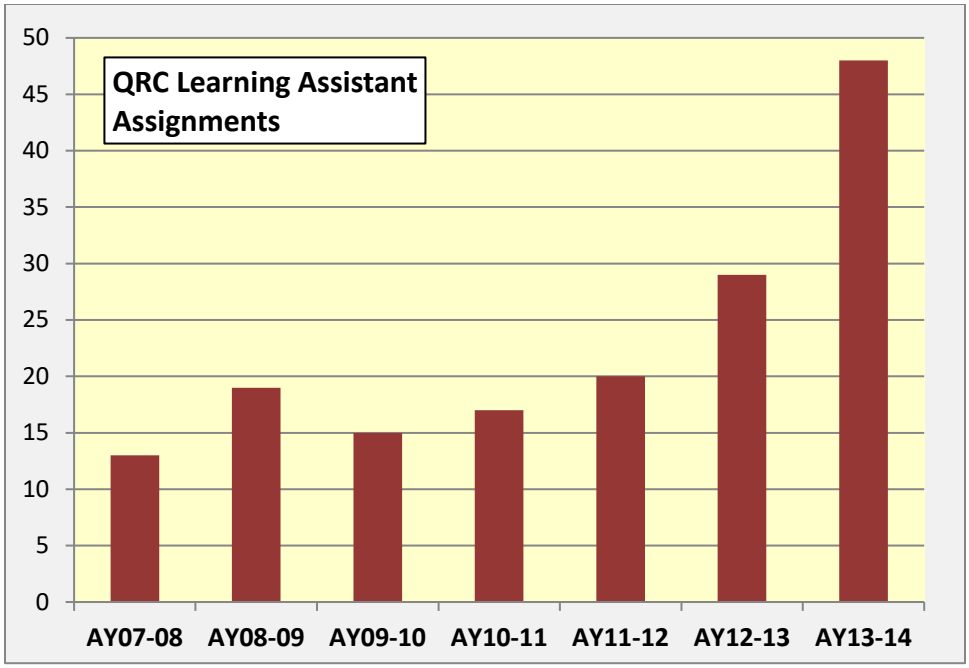

Figure 4. Number of QRC Learning Assistants, the past 7 academic years.

3. QRC Individual Tutoring (i.e., One-on-one Tutoring)

The QRC received about 131 student requests for individual tutoring, or about 16.4 per block. This is a substantial increase over the total of 40 tutor requests the previous academic year. The amount of time spent per block averaged about 7.5 hours per student.

4. Supporting Activities of the QRC Director

Besides the core tutoring services, QRC Director Steve Getty has worked to contribute to the broader Colorado college academic community in a variety of other ways:

- Institutional research on SAT/ACT scores as predictors of success in entry-level STEM courses at Colorado College;
- Initiated college working using a g a Quantitative Reasoning (QR) Assessment with first-year students (collaborative work with Bowdoin, Wellsley, Carleton, Colby-Sawyer, etc)
- Taught with Tabor, Kuerbis the Saturday seminar course for MAT candidates (ED555);
- Teaching courses, guest lectures, or quantitative planning and collaboration with faculty in a number of departments

  Geology: Siddoway, Leonard, Fricke (EV128, GY212, GY211, GY315)

Physics: Burns, Lang, DiCenzo, Purdue, Whitten, Lazarova (PC241, PC242)
Education: Taber, Stanec, Whitaker, Freeman (EV128, ED403, ED530, ED211)
Anthropology: Fish (AN101)

- Reader on MAT theses, and leader in MAT panel presentations
- Collaboration with college faculty on student research projects:
  - Chemistry, Bower, 3 students: *Biomonitors of Atmospheric Chemistry along the Front Range*.
  - Psychology, CILET colleagues, 1 student: *Motivation on the Block Plan at Colorado College.*
- CILET grant (with Colket Director Freeman) to study student motivation on the Block Plan;
- CC Lead for a multi-college proposal regarding STEM education to the Helmsley Foundation;
- Co-PI on an NSF grant investigating measures of student motivation in STEM (with colleagues at BSCS, James Madison Univ, and Univ of Virginia);
- Several academic papers published, submitted, or revised to journals;
- Joined the National Numeracy Network to support collaborative work with other QRC Directors
- Variety of professional and community outreach efforts representing Colorado College

5. Summer Use

Summer activities for the QRC have centered on modest support through Learning Assistants with 8 courses, and several individual tutoring assignments. The QRC has also been part of a pre-college student mentoring program run through the office of summer session.

6. *QRC Program Evaluation*

The QRC has begun modest work in program evaluation to assess the services provided. In late March, 2014, 19 students were offered positions as new QRC tutors, some of whom would start in April, 2014. All participated in a 4-hour training (two, 2-hour sessions) centered on QRC tutoring pedagogies and practices. At the completion of those sessions, an 11-item survey was compiled to assess the extent to which the practices emphasized in the new tutor orientation were observed as occurring in QRC tutoring sessions. The materials should have been fresh on the mind of the new QRC tutors (Appendix A).

Results

The 19 new QRC tutors observed 70 tutoring sessions during Block 7 in April, 2014. In accordance with Drop-In tutoring patterns at the QRC, most sessions were in Math (53%), Physics (21%), and Chemistry(16%). Several students also selected to observe individual tutoring sessions, or Learning Assistant (LA) led sessions. Those were included with the total results, as the practices and protocols would be expected to be very similar. Sessions were observed with an average of 1.4 students (maximum of 6 students). The duration of observed sessions ranged from 2 minutes to 30 minutes.
An important goal of the new QRC tutor sessions was to evaluate the flow of the session, from greeting to closing. The table below shows means on a scale from 0-10, with maxima and minima values (i.e., score of "10" means that tutor did superfabulous with that stage). Interestingly, a point that was emphasized repeatedly in the new tutor orientation, stage 6 below ("*after initial round, tutor elaborated or applied with different, related questions to test understanding*"), had the lowest overall average, as well as individual sessions with no evidence that any elaboration had occurred. This is not always due to the tutor, as often tutees at times abruptly leave when they obtain the information that they seek. Similarly, several other sessions had no evidence of a stage in the flow of a tutoring session (highlighted

yellow). For example, several new tutors were surprised when the QRC did not check-in a student, or have a friendly close to session. These data will support QRC tutor training next year, as well as provide formative data for QRC tutors to investigate and improve upon.

#	Answer	Min	Max	Average	Std Dev	Responses
1	clear greeting; tutor approachable.	2.0	10.0	**8.2**	1.8	70
2	guides check-in.	0.0	10.0	**7.5**	3.2	69
3	Listens to tutee; builds rapport.	3.0	10.0	**8.4**	1.6	70
4	uses lower-level thinking or questions to help clarify the problem, or the tutee's thinking.	2.0	10.0	**7.7**	2.0	70
5	uses higher-level thinking or questions to help clarify the tutee's understanding of larger concepts.	1.0	10.0	**6.6**	2.4	69
6	After initial round, tutor elaborated or applied with different, related questions to test understanding	0.0	10.0	**5.9**	2.9	69
7	Friendly closing, check-out	0.0	10.0	**8.1**	2.4	68

The new QRC tutor orientation also included a segment discussing how to use Bloom's taxonomy as a framework to understand the types of questioning that can be used in tutoring. In this context, questions that a tutor may use range from lower-level questions determining if the tutee has basic knowledge, to higher-level questions encouraging or guiding the tutee to synthesize or evaluate information, data, or content related to more comprehensive concepts. It was emphasized that while learners strive toward higher-level thinking over their college tenure, each tutoring session would not necessarily include higher-level questioning. There are several reasons for this. It depends on the student and context, as many students come to the QRC seeking assistance with basic information, such as for courses required for a major (e.g., CH107 for other science majors).

The assessment results show that the sample of QRC tutoring sessions are in fact clustered toward support of lower-level questioning of tutees by tutors. Most of the tutor work appears to reside in the first 3 levels. This is encouraging, as it would not be expected that each session would rise to evaluation and synthesis levels, and relates to face validity of the survey protocol for observers.

Answer		Response	%
1 - low level: Knowledge		57	81%
2 - Comprehension		62	89%
3 - Application		49	70%
4 - Analysis		30	43%
5 - Synthesis		22	31%
6 - high level: Evaluation		9	13%

Another important part of tutoring (and teaching) is using different means to engage the learner. These include aural, visual, or kinesthetic approaches, as well as different resources related to the content. It was very interesting to note that despite the 3 large whiteboards in the QRC (and an ample supply of

low-odor dry erase pens), the use of scratchpaper in tutoring sessions (36% of sessions) was equally common as the use of whiteboards (36%). The other commonly used resource in a tutoring session was the textbook, whether provided by the learner or the QRC. Other support indicated by the shadowing QRC tutor were other tutees, expressive hand gestures, and in just 2-3 cases the QRC computer.

New QRC tutors were also given two open-ended questions about the session that they observed. The first question regarded the "neatest" thing that they saw each session. The second related to whether they observed anything unexpected or surprising, in the context of their tutor training the previous week. Overall, this question elicited descriptions (prompted thusly) of tutors supporting students. Regarding things unexpected were QRC tutors not signing-in tutees, and tutors texting during sessions (just a few instances). This provides the QRC with some valuable formative data for next academic year to use in sessions with peer tutors.

Future Directions:

- Develop pre-semester with International and Bridge Program students;
- Continue working with faculty introducing modeling and excel skills into courses (as is appropriate);
- Continue to expand QRC services and academic support;
- Complete college work in several areas (e.g., GEOC Quantitative Reasoning requirement, research for the Center for Immersive Learning and Engaged Teaching).

Appendix A:

QRC Block 7 2014 Tutor Session summary

Q1. *The Colorado College QRC, Spring, 2014 This survey is for QRC visits ("shadowing") by new tutors joining the QRC in the Spring and Fall of 2014. Current tutors will be notified. The questions reflect what the new QRC tutors and the Director identified as elements of a QRC tutoring session during the March, 2014, new tutor orientation. The item averages are mean indicators for a sample of block 7 sessions. The survey is not an evaluation of current QRC tutors (e.g., no current tutor names or times are included).*

Q2. Your name: _____

Q3. Subject in the session

- ❍ Chem/Bio
- ❍ Math/Stats
- ❍ Physics
- ❍ Econ
- ❍ Psych
- ❍ Geo/EV
- ❍ Other

Q4. Was the session

- ❍ Drop-in at QRC
- ❍ Learning Assistant session
- ❍ Other

Q5. How many tutees were involved?

_____ slide bar for number (scale of 1-15 students)

Q6. What was the duration of the session (enter minutes)

_____ slide bar for minutes (scale of 2-30 minutes)

Q7. Score each on a scale of 0-10 (10 being super-fabulous!) for the parts of a tutoring session. The tutor....

_____ Clear greeting; tutor approachable.
_____ Guides check-in.
_____ Listens to tutee; builds rapport.
_____ Uses lower-level thinking or questions to help clarify the problem, or the tutee's thinking.
_____ Uses higher-level thinking or questions to help clarify the tutee's understanding of larger concepts.
_____ After initial round, tutor elaborated or applied with different, related questions to test understanding.
_____ Friendly closing, check-out.

Q8. Select any of the levels (Bloom's) of questioning or thinking used in session (can select from none, to all).

- ❑ 1 – low-level Knowledge
- ❑ 2 - Comprehension
- ❑ 3 - Application
- ❑ 4 - Analysis
- ❑ 5 - Synthesis
- ❑ 6 – high-level Evaluation

Q9. Write the types of resources (e.g., whiteboard, scratchpaper, text, solution manual, another tutor, etc.) used by the tutor in the session.

Q10. What was the neatest, best thing that you saw the tutor do?

Q11. Compared with QRC new tutor orientation, did you see something not quite expected or surprising given peer tutoring objectives at the QRC?

Q12. Do you have evidence that the tutee increased their understanding of concepts in the session? If yes, write what that evidence is.

Q13. Please share any other observations or insights from the tutoring session.

Thanks for your comments!
We'll look forward to the lunch to discuss.
Select >> to Submit.