



Those who can, teach. Immersing Students as Peer Educators to Enhance Class Experience

Dr. Beverly Kristenson Jaeger, Northeastern University

Beverly Kris Jaeger, PhD has been a member of Northeastern University's Gateway Team, a selected group of full-time faculty expressly devoted to the first-year Engineering Program at Northeastern University. Recently, she has joined the expanding Department of Mechanical and Industrial Engineering at NU to continue teaching Simulation, Facilities Planning, and Human-Machine Systems. Dr. Jaeger has been the recipient of several awards in engineering education for both teaching and mentoring and has been involved in several engineering educational research initiatives through ASEE and beyond.

Béa van den Heuvel, Ellen Wilson and Kerri Liss are senior Industrial Engineering majors at Northeastern University. All are active members of the university including their participation in engineering student groups. Béa has served as the Connections (female engineering) Resident Assistant and is a Gordon CenSSIS Scholar. Ellen has been a member of the Institute of Industrial Engineers (IIE) since 2009 and has held most IIE leadership positions. Kerri has served on the board for the Society of Women Engineers (SWE) and has participated in the Gordon Engineering Leadership Boot Camp. All have served as Quality Managers during their time at Northeastern and have shown interest in and passion for improving engineering education in a variety of ways including volunteering as Freshman Engineering Peer Mentors.

Miss Kerri Liss, Northeastern University

Ms. Bea van den Heuvel

Ellen Wilson, Northeastern University

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Education has the power to transform not only the learner, but the teacher.

Abstract

In the university setting, Quality Managers are students who are enrolled in a course of interest and serve as instructional and supportive extensions of their professor in lab and class settings. They are recruited, selected, and guided by the course instructor and serve for only one lab or assignment per semester. Through the assistance of Quality Managers (QMs), engineering educators are able to retain higher-level classroom and lab experiences that would otherwise need to be scaled back –or even eliminated– due to the limitations posed by large classes. The motivation and original implementation of a Quality Manager program has been described and assessed in prior ASEE research.¹ Typically, QMs are selected in teams by the instructing faculty to assist in guiding related lab or class activities and provide feedback. Our current research hypothesizes that, in addition to serving the students and the instructor, the QM program also benefits the *Quality Managers themselves*. This study explores the individual effects of participating as a QM. By building on initial research that focused on non-QM student beneficiaries and the educators, this work first assesses the effect of the QM program on the Quality Managers. Next, this study seeks to learn from their experiences and finally, defines the QM's role more clearly to further outline a model that is readily adoptable and applicable across engineering disciplines and potentially for environments that extend beyond the classroom.

Keywords: Guided learning, peer-assisted teaching, peer-assisted learning, engineering, higher education, instructional scaffolding.

Introduction and Background

Educational Trends. Many university-level Science, Technology, Engineering and Math (STEM) subjects are experiencing a decline in Teacher-Student Ratios (TSR) and the push for technologically enhanced classrooms, which increases the challenges associated with teaching these already complex courses. As discussed in “ATLAS - Academic Teaching and Learning Assistants Study: The Use of Peers as ‘Quality Managers’ in Engineering Class Instruction,” the dwindling teacher-student ratio “is the result of several factors, namely (1) diminishing resources for faculty and/or graduate teaching assistants, (2) an inclination toward enlisting only university faculty with the highest possible degree, (3) a trend toward learning methods that depend less on instructor-based pedagogy and foster either individual/solitary responsibility for learning or group-based education, and/or (4) improved and enhanced technology, materials, and activities in response to student-centered learning described in (3) above.”¹ Smaller class sizes is one possible solution to this challenge; however, other innovative options exist and can address these underlying issues without adjusting class sizes or requiring only the most experienced professors.

Instructional Scaffolding. The decrease in TSR creates the challenge of bridging a gap in which students' learning expectations are increasing just as much as class sizes are. Throughout academic history, a theory of "closing the gap" has been tackled through *instructional scaffolding* practices. Instructional scaffolding is the intentional use of a resource for learning-enhancement purposes. Psychologist Lev Vygotsky, who specialized in developmental psychology and education, describes this gap as the opportunity between "actual developmental level as determined by independent problem solving" and the level of "potential development as determined through problem solving under adult guidance or in collaboration with more able peers."² While instructional scaffolding was traditionally used in early education settings, it can be applied to higher education for complex subjects that are being taught for the first time, particularly in the form of *peer-scaffolding*.

A study on scaffolding in technology-enhanced learning environments, "*Bridging Research and Theory with Practice*," explores the possible effects of student learning development "in collaboration with 'more able peers'." While it is apparent that peer-assistants are potentially valuable to the cost-effectiveness and quality of education for their classmates and instructors, there is still limited data on the personal and individual effects on such peer assistants. One study touches on some of the personal gains of a peer learning assistant stating, "The cognitive processes involved in peer tutoring have been explored by various writers over the years, many of whom emphasized the value of the inherent verbalization and questioning."³ This means that Quality Managers have the unique opportunity to assume a role that provides guidance without giving direct instruction. Through the Quality Management program, QMs are trained to be the "more able" peer within the classroom lab activity so that they can help bridge the instructor-student gap and take the classroom learning to the next level.

Knowing that cognitive load and limited prior experience are among the greatest challenges for students participating in peer-scaffolding, this study intends to uncover the Quality Managers' insight into the program. In the following study, Quality Managers' learning has been measured to understand the degree to which they become a "skilled other" in the scaffolding equation.

Brief History of Peer Education

Learning Engagement. The Teacher-Student ratio is not the only factor changing within higher education. The days of the traditional lecture halls are gone. Classrooms without a Smartboard or at least a computer are considered archaic. Technology is advancing and the classroom must be modified accordingly. Teaching styles have also been adjusting to cater to the technological preferences and expectations of learners. What can we, as educators, do to ensure the complete engagement of our students who may easily tune out if their technological or intellectual expectations are not being met through traditional lecture style? Some say stop lecturing. In an article entitled "Assessment for Learning and Skill Development: The Case of Large Classes," Wanous *et al* illustrate a new goal of involving students as deeply as possible in teaching, learning, and assessment activities in their Professional Studies.⁵ They include a quote from

Ronald Dearing that states, “Students will increasingly need to develop new capabilities and manage their own development and learning throughout life ... this is why giving students more responsibility for their own learning and development is so vital.” As educators, we must give students responsibility for their work that it requires their full attention. The Quality Manager program is both a flexible and active approach to student-led teaching, which invites students to fully participate in the learning process. Get –and keep– students involved and aware, otherwise they might just tune out and start tweeting through their boredom.

Peer-Assisted Learning. Peer-teaching opportunities arise when traditional methods of teaching are not fully supporting the learning style or needs of students. The report “Peer Teaching: To Teach is to Learn Twice,” describes a historical shift from traditional lecture to student-centered teaching. Authors Whitman and Fife recall, “One of the first teachers to plan and direct peer teaching in higher education was Marcel Goldschmid at McGill University in Montreal. He reported that the impetus for experimenting with instructional options was his dissatisfaction with the lecture method in large undergraduate classes of 200 to 300 students. He observed that lecturing as a routine teaching method was ineffective because it forced the college students to be passive and provided little or no exchange with the professor.”⁴ History also shows us that the peer teacher has experienced benefits during this process. The above article describes the benefits through Bargh and Schul who found that students personally involved a teaching situation scored higher on an achievement test than those who did not teach. They theorized that preparing to teach someone else could produce a more highly organized cognitive structure and go on to note that this can occur inside and outside of the classroom, both before and during instruction.⁴

In more recent years, there have been accounts of successful peer-to-peer mentoring or teaching programs from which we can learn. One pursuit of peer-teaching, effectively named “SPAM” for Student Peer Assisted Mentoring, has implemented a peer-mentoring program in higher education for a number of different reasons, including improving retention rates and enhancing student self-esteem. Similar to aspects of the Quality Manager program, which will be discussed later, SPAM requires the peer mentor to hold some time outside of class when the students of the class at large can come to ask questions without the hesitation associated with making inquiries in the formal classroom setting. In the 2008 academic paper, Student Peer Assisted Mentoring (SPAM): A Conceptual Framework, Kirkham and Ringelstein summarize the benefits of a student mentor stating, “The students’ own learning improves from having to structure and provide explanations and problem-solving techniques. In addition to this, they develop a number of skills such as communication, leadership, and dealing with team dynamics.” From peer-teaching programs in higher education throughout history, we can see how teaching styles are shifting and we can learn from these programs. The peer-teachers themselves can provide great insight into how to further improve peer teaching so all parties benefit and college students are engaged and retained in challenging classroom environments with complex STEM course work.

Quality Managers. In previous research conducted at Northeastern University and published in the paper, “ATLAS - Academic Teaching and Learning Assistants Study: The Use of Peers as ‘Quality Managers’ in Engineering Class Instruction,” the role of undergraduate peer teaching assistants was introduced, explored and formally developed.¹ This foundational work outlined the impact that these Quality Managers have on *classroom learning experiences* as well as on the *quality of written materials* used for coursework. The QM role has been described in ASEE’s ATLAS study as students who are “currently enrolled in the course of interest and assist the instructor in a manner that resembles an assistive teaching role in addition to providing relevant feedback on the assignment or lab of interest.”¹ The research concluded that students in classes utilizing QMs experienced a variety of measurable benefits, as did the course instructor. Typically 2 to 4 student QMs have been used for class sizes of 24-48 students. *Figure 1* shows a QM team. *Figure 2* shows QMs in the classroom setting, assisting peers with assignments

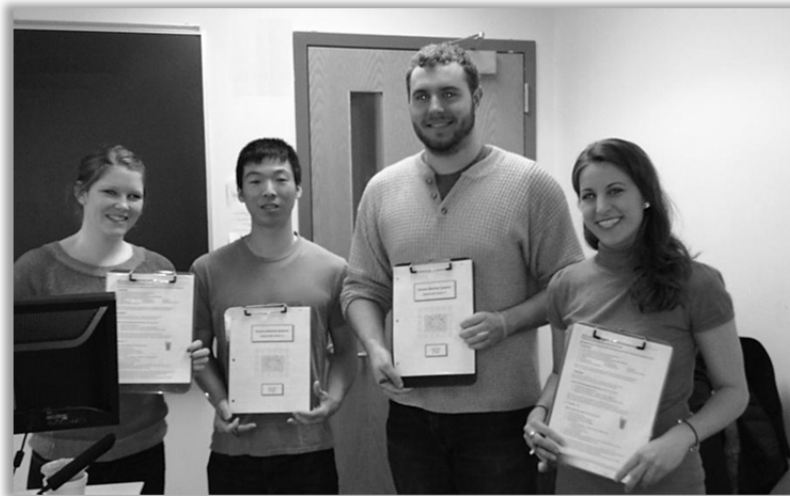


Figure 1: A Quality Manager Team equipped with clipboards.



Figure 2: Students serving and assisting as Quality Managers: In the lab setting (left), in the classroom (right).

An overview of the QM program protocol is outlined in *Table 1* below. Because each assignment and lab is different, this is an outline of the standard procedure that can be adjusted for the needs of the instructor and the objectives of the activities.

Table 1: Standard Quality Manager Protocol and Outcomes

	Phase & Timing	Instructor	Quality Managers	Outcome
1	QM Recruitment <i>Early in term, 10 min</i>	Recruits, Selects and/or Assigns QMs	Volunteer and/or are selected through request and agreement	List of QMs for course
2	QM Orientation <i>≥ 1.5 weeks in advance, 15 min</i>	Meets with QMs: Reviews objectives and activities	Attend brief orientation with instructor, usually as a team	Align all with lab/class objectives and related activities
3	Assignment Preview Advance Completion by QMs <i>~1-2 hours</i>	Provides written assignment to QMs. May be available to clarify, guide and advise	Proofread document and conduct assignment activities, mostly independently	Clarified assignment and experienced QMs
4	Assignment Refinements and Updates <i>≤ 1 hour as needed</i>	Responds to QM input and suggestions. Refines written material and class activities accordingly	Informed of any changes to lab or assignments, are provided updated version	Improved assignment and more fully prepared QMs
5	Class/Lab Time! <i>1-2 hours as scheduled</i>	Guides class, provides QMs with clipboards and introduces them to the class, partners with QMs, experiences the class, is able to adjust and instruct with more freedom	Assist and guide class-mates, answer questions, confer with instructor, help with materials, take notes on class activities	Improved TSR, smoother lab, richer experience for all involved
6	QM Post-lab Review <i>~20 min QMs</i> <i>~20 min Instructor</i>	Receives final observations and written suggestions from QM representative(s)	Provide instructor with edits, observations and ideas for improvement, consideration, clarification	Refined, improved lab/assignment and considerations for grading and the future

Motivation for further exploration

By guiding peers in their own course activities, Quality Managers offer a unique viewpoint in the classroom; this study explores the QM perspectives as both assistant educators and as students. Quality Managers are the pivotal elements in the success of this peer-educator initiative because they provide a bridge between the professor and the general students. A deeper understanding of the QM experience from the Quality Manager's perspective can be a step to ensuring an efficient and successful program.

Results from the ATLAS study suggest several positive benefits to QMs themselves, and provide directions for deeper questions and a larger sample. The previous ATLAS study shows that "100% of 13 QM's surveyed felt that their relationship with the professor improved...100% of these QM's felt that they were fairly rewarded for their work in the QM capacity, and had the

general impression that QM's grades were typically higher than those of the general students – yet these grades were well-earned...and finally, every single respondent who served as a QM stated that they would agree to be a Quality Manager again, 100%!"¹ With such positive initial results, this study continues to research this program, by focusing specifically on how students are changed and affected by serving a Quality Manager.

To continue this research, more extensive data was gathered to gain a more detailed sense of the QM role. What makes a QM to want to be a QM? Why would they sign up more than once? What are they getting out of this Program for themselves? Are they achieving a higher threshold of learning and a more solid grasp of the course material and application? Inspired by these exploratory questions behind the ambition, perceptions, and outcomes of becoming a Quality Manager, this study plunged further into QM research. Along with these inquiries, motivation for this study provided data for improving the program. Understanding the challenges along with the benefits that QMs experience will contribute towards the continuous improvement of the learning experience.

Methodology

Survey. Following certification from NIH on Protecting Human Research Participants and an educational exemption from the Division of Research Integrity (DRI), a survey was developed for students who participated as Quality Managers over the past five years. This mixed-format style survey was administered in the fall of 2012 to mostly Industrial Engineering students regarding four core classes taken by undergraduate students in their third, fourth and fifth academic years. The general objectives of the survey were disclosed on the first page of the survey. Two different tracks were provided for participants: one track for those who had served as a QM once and another track for those who had served more than once. This was done to collect students' impressions from multiple courses. Additionally, participants were assured that the survey was conducted confidentially. Please see *Table 2* for more demographical details.

Subjects. The surveyed students were enrolled in the following courses:

Table 2: Courses of Interest and Enrollment Data

Name of Course	Semester and Year	Academic Level	Number of Sections	Class Size	# Labs using QMs / # of QMs used*
Facilities Planning	Spring 2006	Junior, Year 4	1	31	1/1
Facilities Planning	Fall 2007	Junior, Year 4	1	22	3/3
Human-Machine Systems	Spring 2008	Senior, Year 5	1	36	4/8
Digital Simulation Techniques	Fall 2008	Middler, Year 3	1	22	5/10
Human-Machine Systems	Spring 2009	Senior, Year 5	1	37	4/10
Engineering Design	Spring 2009	Freshman, Year 1	2	29, 24	1/2, 1/2
Human-Machine Systems	Spring 2010	Senior, Year 5	1	38	4/14
Digital Simulation Techniques	Fall 2010	Middler, Year 3	2	17, 26	3/8
Human-Machine Systems	Spring 2011	Senior, Year 5	1	33	4/16
Facilities Planning	Fall 2011	Junior, Year 4	1	17	4/9
Problem Solving & Computation	Spring 2012	Freshman, Year 1	1	28	1/2
Human-Machine Systems	Spring 2012	Senior, Year 5	1	40	4/18
Simulation Modeling & Analysis	Fall 2012	Middler, Year 3	2	33, 34	5/19, 5/20
<i>*A maximum of four QMs are used at one time for a particular lesson, typically two QMs are assigned per lesson.</i>					

Procedure. Once the questionnaire was granted exempt status from the Division of Research Integrity at Northeastern University, an introductory primer email was sent to 84 previous QMs on record. Of the 84 students, 11 had served as a QM for two labs/activities in different courses. The online survey link was then sent to these former and current students to assess their personal impressions of aspects of the program. The survey consisted of Likert-scale, open-ended questions, and checkbox-style questions. The team included a Human Factors Research Specialist who assisted in survey development. A total of 54 respondents participated in the survey. Once respondents were de-identified, the survey data was compiled in Microsoft® Excel for assessment and statistical analysis. The team completed a 4-way multi-pass content analysis to evaluate open-ended questions.

Results and Discussion

The feedback from the surveyed Quality Managers validates that, in addition to serving the students and the instructor, the QM program also benefits the *Quality Managers themselves in multiple ways*. The research seeks to better understand the QM role from the Quality Manager's perspective and thereby further refine the position. The questions asked were aimed at understanding the degree to which QMs become a "skilled other" in this peer-scaffolding program.

Being a Quality Manager is an invitation to be a part of an intricate learning process. Our survey and analysis of this process depicts the Quality Manager position as one containing four broad stages. These stages include Stage 1) Sign-up and Selection, Stage 2) Orientation and Preparation, Stage 3) Lab/class Time, and Stage 4) After-class Time and Reflection. The following section is a discussion of the results from descriptive statistics analysis as well as a content analysis of open responses for all four phases. The discussion revolves around student responses both qualitatively and quantitatively in an effort to effectively measure the successes and challenges involved throughout the entire process of being a Quality Manager.

Stage 1: Sign up and Selection

Reasons for Initially Becoming a QM. It is important to understand what motivates a student to become a QM. The process to become a QM starts at the instructor's discretion. Some methods of selecting QMs include inviting students to participate or having a sign-up sheet. It is possible that the method of selection and the instructor's introduction to the role could motivate different students to participate.

The survey listed a series of statements and asked students to rate how applicable each of the factors was in their motivation to become a QM. As seen in *Figure 1*, the results revealed that the least motivating factors in becoming a QM included not needing to complete a formal lab write-up and assuming that a higher grade would be received. Furthermore, 43% of the students selected "not applicable" to the statement "I was asked by the professor and felt like I had to be a QM." This response infers that the subject did not feel obliged to become a QM solely because the professor invited them to participate. However, 76% responded that the combination of instructor's invitation and personal desire to become a QM influenced their decision to participate. Additional factors that influenced students to participate include wanting to improve their relationship with their instructor and prior participation by fellow peers.

The following three figures summarize the QMs' responses. *Figure 1* displays the least motivating factors, *Figure 2* shows mixed motivating factors, and *Figure 3* presents the most motivating factors. These graphs were separated based on the percent of responses that were "applicable" and "most applicable" for each statement.

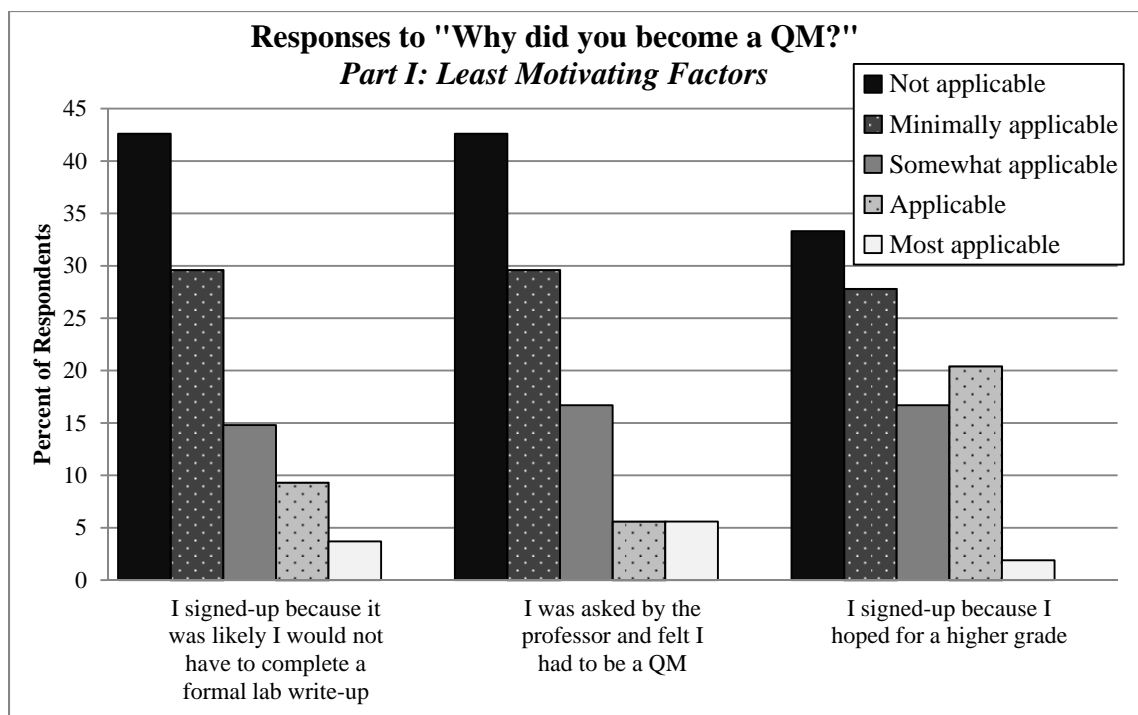


Figure 1: Responses to "Why did you become a QM? For each of the statements below, please rate the following items on a scale of applicability."

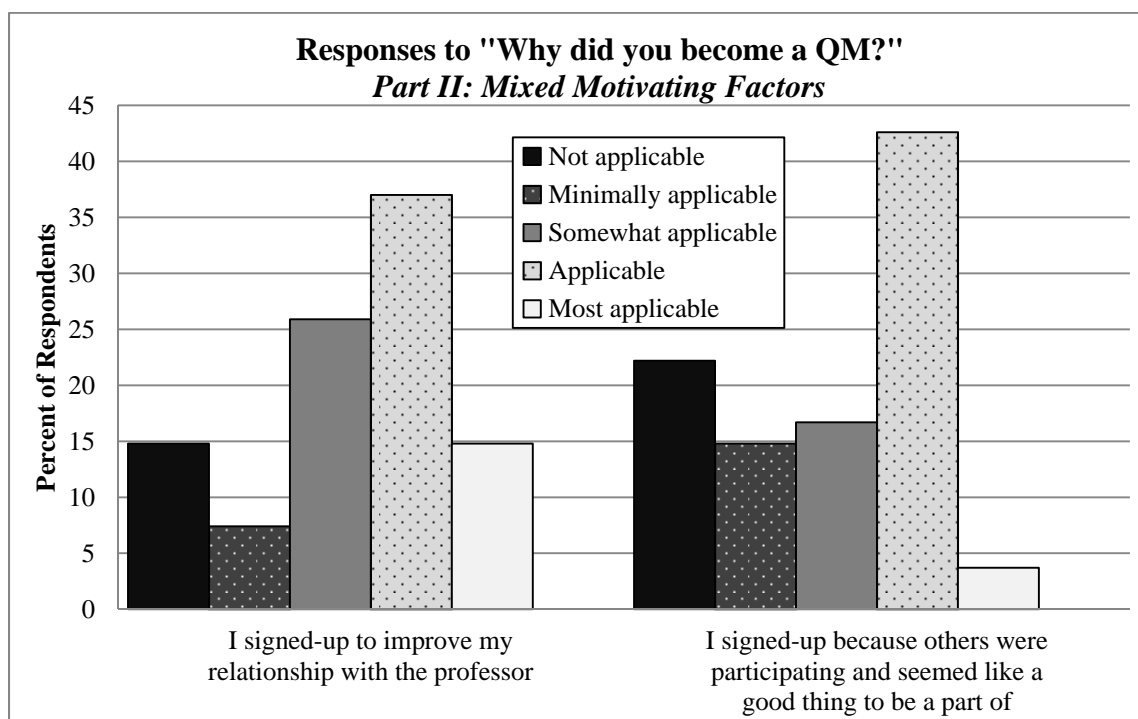


Figure 2: Responses to "Why did you become a QM? For each of the statements below, please rate the following items on a scale of applicability."

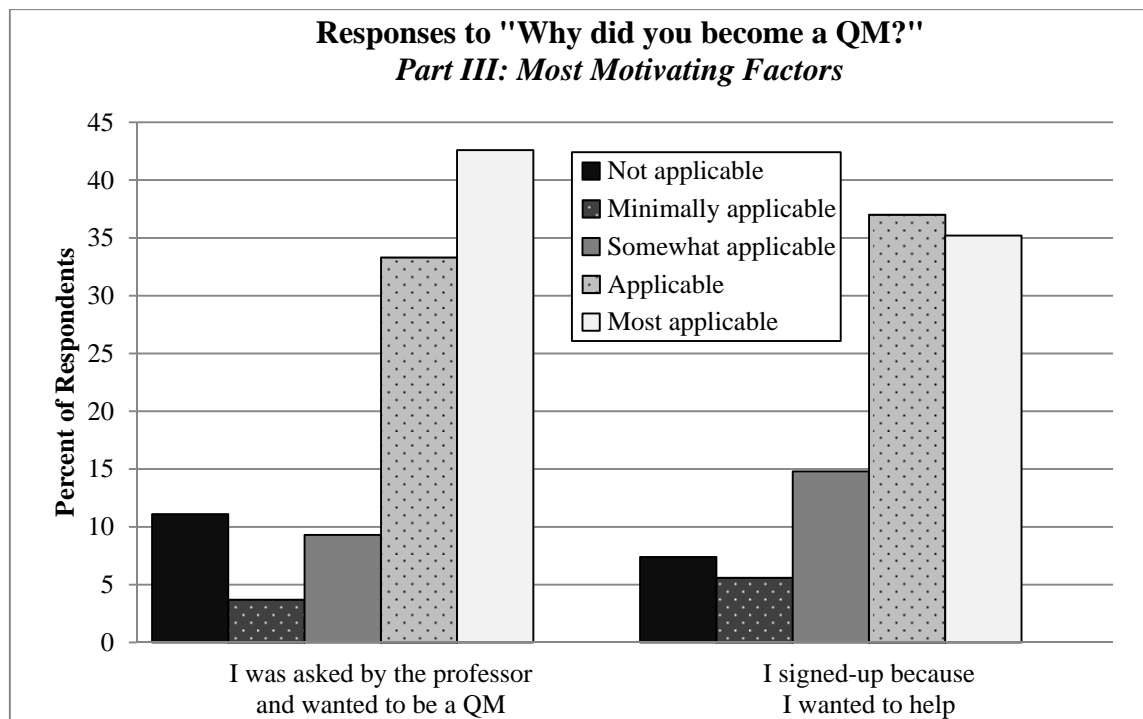


Figure 3: Responses to "Why did you become a QM? For each of the statements below, please rate the following items on a scale of applicability."

Becoming a QM Again. When eleven students who were QMs twice were asked if they would become a QM again, 96% of the respondents said yes. One explanation that was offered on behalf of the 4% of students who would not be a QM again stated that they did not believe that students needed much help during the lab. Comments from this question suggested that they might hesitate depending on the timing of commitment or if the student had prior obligations.

To better understand the motivation behind participating in the QM program more than once, students who had volunteered and served a QM the first time were asked to explain why they became a QM a second time, *Figure 4*. No students surveyed had served as a QM more than twice. The top four explanations included:

- wanting to have a better understanding of the material
- the enjoyment associated with being a QM
- a desire to help/serve their classmates
- looking to work with the professor

One student commented that they participated because their teammates wanted to be Quality Managers and another felt like the instructor may have expected him/her to be a QM.

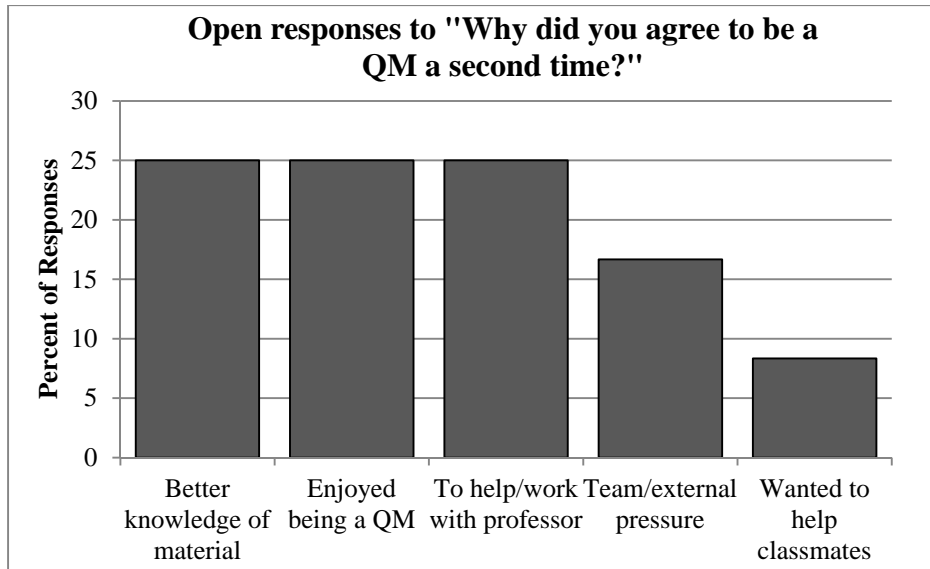


Figure 4: Open response to "Why did you agree to be a QM a second time?"

Response to Being Selected. As seen in *Figure 5*, over 76% of the respondents selected “honored” or “pleased” as the emotion associated with being invited to be a QM. Other feelings included happy, excited, and anxious. 11% of the responses were “neutral”, 10% were “nervous”, and 1% were “guilted.” It is interesting to see that while 11% of the students responded “applicable” or “most applicable” to “I was asked by the professor and felt like I had to be a QM,” that only 1% of the responses were “guilted”, indicating that students who felt obligated to become a QM did not have a unfavorable emotion associated with that obligation.

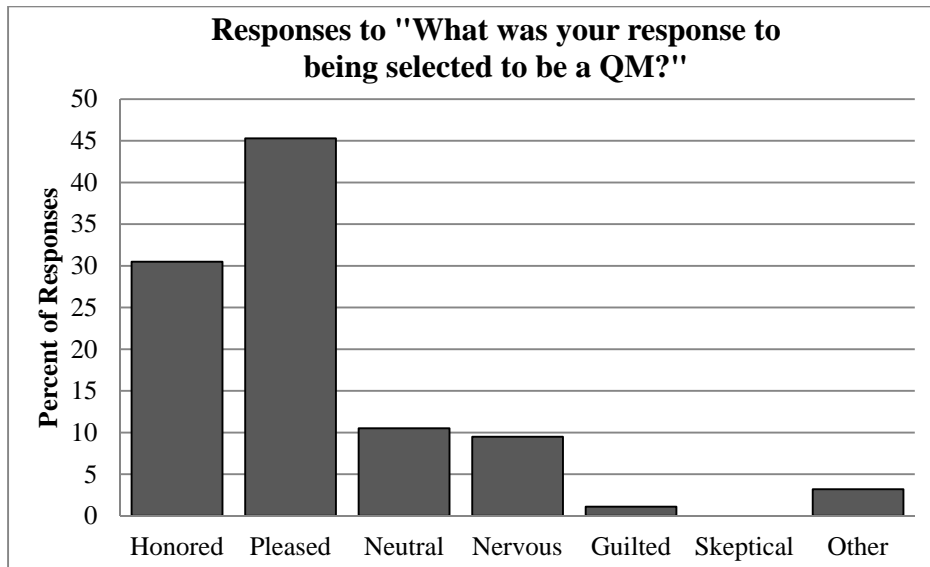


Figure 5: Responses to "What was your response to being selected to be a QM?"

Initial Expectations. Students had expectations when volunteered to serve as a QM. In an open response question, shown in *Figure 6*, students responded to their initial expectations of the role and if they were met. The majority of the replies show that students expected to provide help and assistance and to improve the lab or class material. Other expectations included seeking better knowledge of material (17%), helping the professor or learning about the teaching role (13%), feeling pressured, excited, or challenged by a new role (7%), and wanting more responsibility (3%). Additionally, 71% of responses stated expectations were met, 6% were exceeded, 10% were unmet, and 12% did not respond to whether or not expectations were met. Responses showed that students find it important to know what to expect of the QM role.

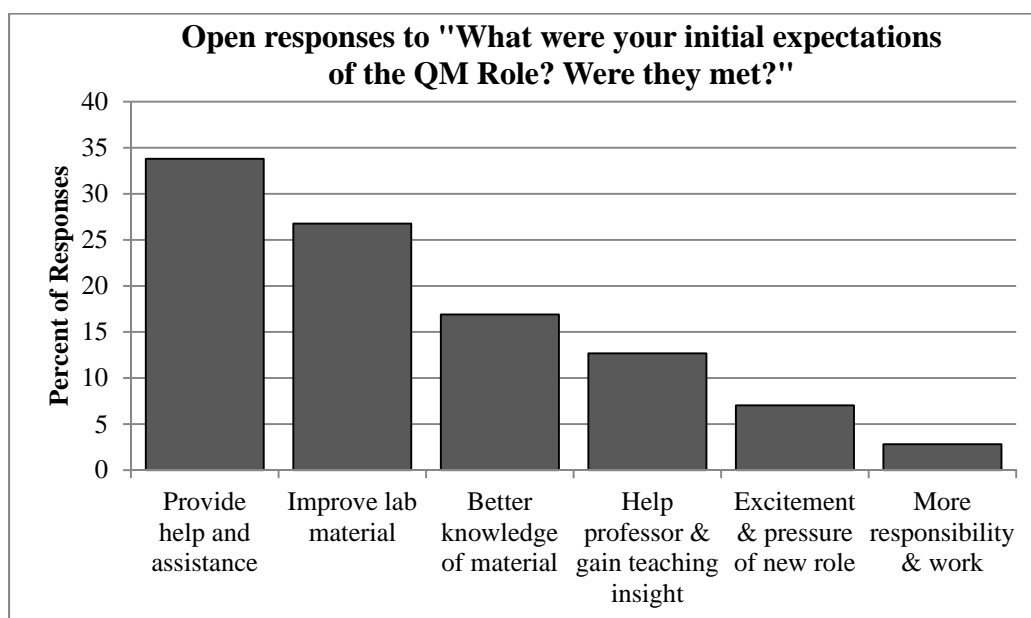


Figure 6: Open responses to "What were your initial expectations of the QM Role? Were they met?"

Stage 2: Orientation and Assignment Preparation

Helpful Preparation Steps. In the survey, students were asked to indicate if the following steps occurred and whether or not they were helpful. When it comes to aiding the preparation stage, below are a few of the steps that students felt were helpful. The most helpful step was to have an informational meeting, followed by providing a similar or existing assignment document of the lab/activity. The third most helpful step was to explain the preparation steps. The outline below lists the preparation steps in the order of usefulness, the most useful being number one.

1. Have at least one informational meeting
2. Provide a similar or existing assignment document of the upcoming assignment
3. Explain what the QM would be doing in preparation for class (editing, proofing, etc.)
4. Explain assignment and lab/classroom objectives
5. Explain the expectations of the QM role in the classroom
6. Give feedback throughout the preparation for the lab/activity
7. Outline approximate time commitment for being a QM

Some comments stressed the importance of maintaining an open and current communication line between the QMs and the professor. If there are changes in the assignment, the QMs should be updated. This is especially true if the instructor is developing a new lab/activity that may undergo several versions. For these situations, it may be beneficial to schedule a meeting prior to the lab/activity that includes a finalized, or almost finalized, version of the assignment. E-mails can also be effective.

Depending on the lab/activity and the student, the QM role definition can range from open-ended to more explicit and prescribed. The purpose of assisting with the assignment should be clearly conveyed, but sometimes a less prescribed approach may encourage exploration on the part of the QM in order to become familiar with aspects of the task.

Understanding Time Commitment. It is suggested that all QMs meet with the instructor *at least* one week in advance, though for most established labs/activities, closer to a two-week lead time is best fitting. Due to the short time frame, QMs should be in contact with the instructor within the week after their first meeting as a follow-up. New labs/activities might benefit from a longer lead time; however, this might result in slightly too much advance time and the students may not have learned enough of the content foundation needed for the lab. Based on these guidelines, 83% of the students responded that the corresponding lead time was a good amount. Please refer to *Figure 7* for the overview.

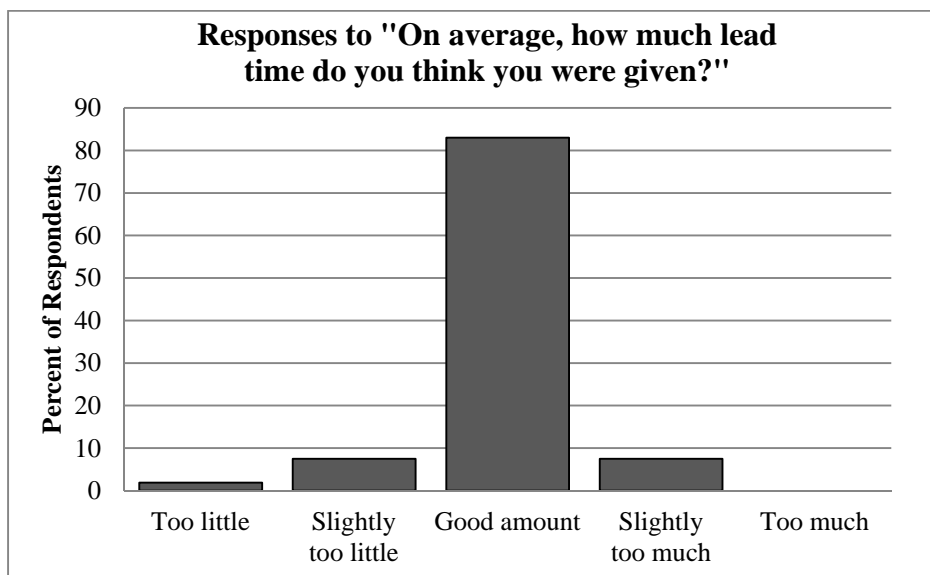


Figure 7: Responses to “On average, how much lead time do you think you were given to review the particular QM lab/activity before class?”

Preparation for Becoming the “More Able” Peer. Being able to provide constructive criticism is an important skill to learn. During the QM program, students are to edit an assignment document that is typically drafted by the instructor. In order to provide feedback and improve the

clarity of the lab/activity, QMs should be able to critique. If QMs are encouraged to do so, they are more likely to feel comfortable with correcting or changing an assignment. It is important students know not to hesitate in correcting the instructor and that there will likely be some necessary changes. Students commented that they understood that providing critique is a way to fulfill their duties as a QM, showing they understand that aspect of their role. They also commented that they were unsure if some of the minor details were worth bringing up. Allowing students to electronically proofread, edit, and comment within the document may encourage minor edits to be made more naturally. Another valuable remark was that having a QM team helped make the student more comfortable with correcting the lab/activity. As seen in *Figure 8*, 55% of respondents assumed that making changes or corrections to the lab/activity was a part of their role and no respondents felt hesitant or uncomfortable in doing so.

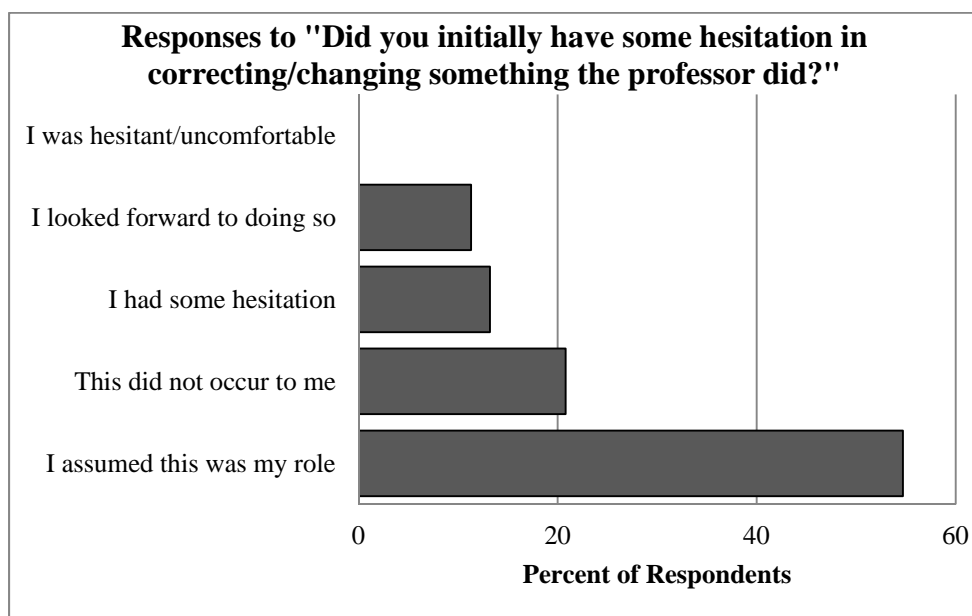


Figure 8: Responses to “Did you initially have some hesitation in correcting/changing something the professor did?”

Stage 3: Lab/Class time

Perceived Primary Role of QM. As previously stated, serving as a QM is a pivotal, relational role. The importance of this role must be defined clearly so that all involved in the program understand the responsibilities and potential of the QM. Typically, a QM should be regarded as a helper, or someone who is there for basic guidance throughout the lab or class activity. This is different from a peer, as QMs must guide the learning process and perform at a level that is a step higher than classmates. Furthermore, this should not be a replacement for the traditional teaching assistant (TA) or grader role. QMs should not aid with the grading process and are not otherwise compensated.

The survey asked students to evaluate what role they thought they held from three perspectives: (1) personal perspective, (2) peers' perspective, and (3) the instructor's perspective. The five defined choices were peer, helper, tutor, TA, or instructor. The role of 'peer' is referred to as a fellow classmate or colleague, a 'helper' is a source of basic guidance in and out of class, a 'tutor' provides step by step guidance, a 'TA' performs in a formal assistant role but is generally not immersed in course material, and the 'instructor' is a subject matter expert.

The encouraging results showed that QMs primarily viewed themselves as helpers. *Figure 9* shows 72% of the respondents selected helper, while 15% selected peer. When asked to evaluate what position they felt their classmates viewed them as, similar results were observed. This confirmed the belief –and the intention– that QMs are typically regarded and serve as helpers.

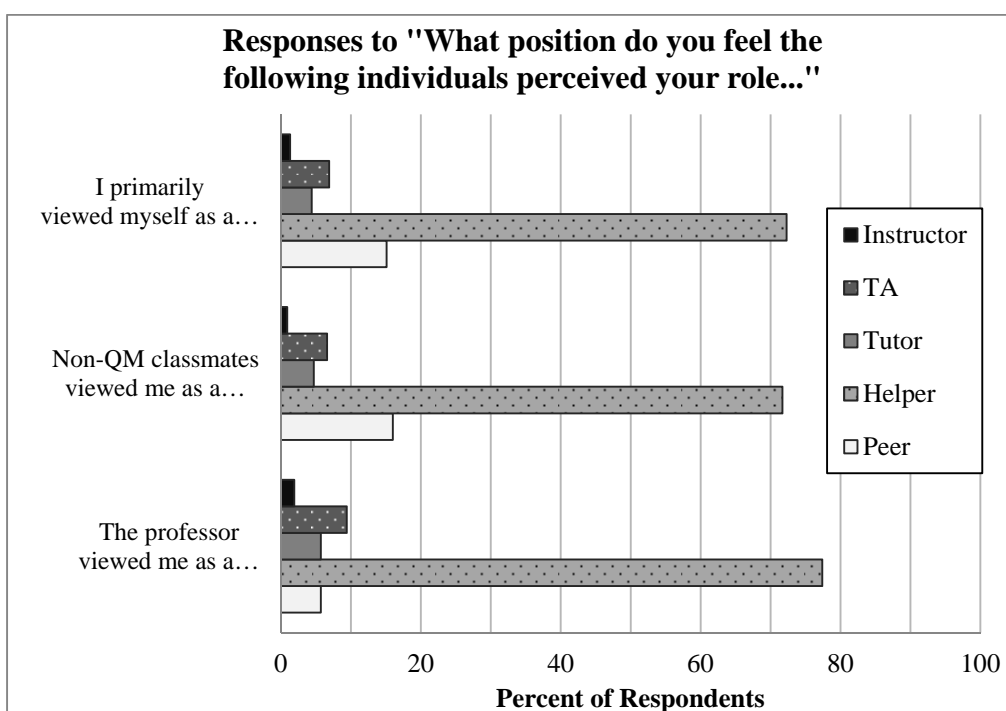


Figure 9: Responses to "Your role as the QM for the lab can be viewed from multiple perspectives in the lab/classroom. What position do you feel the following individuals perceived your role as the QM to be?"

Level of Responsibility. Understanding the QM role is important, but how do Quality Managers feel their level of responsibility measures up to the expectations given? When asked whether QMs felt that they had an appropriate level of responsibility in the classroom, 85% of students felt they had a good amount of responsibility and 14% suggested that they had a level of responsibility that was too little or slightly too little while in the classroom. These results have been shown in *Figure 10*. In some cases QMs were less busy during class because they had already served their primary purpose and precluded the need for their services by doing the lab preparation work so well. Perhaps there is opportunity to give the QMs more responsibility.

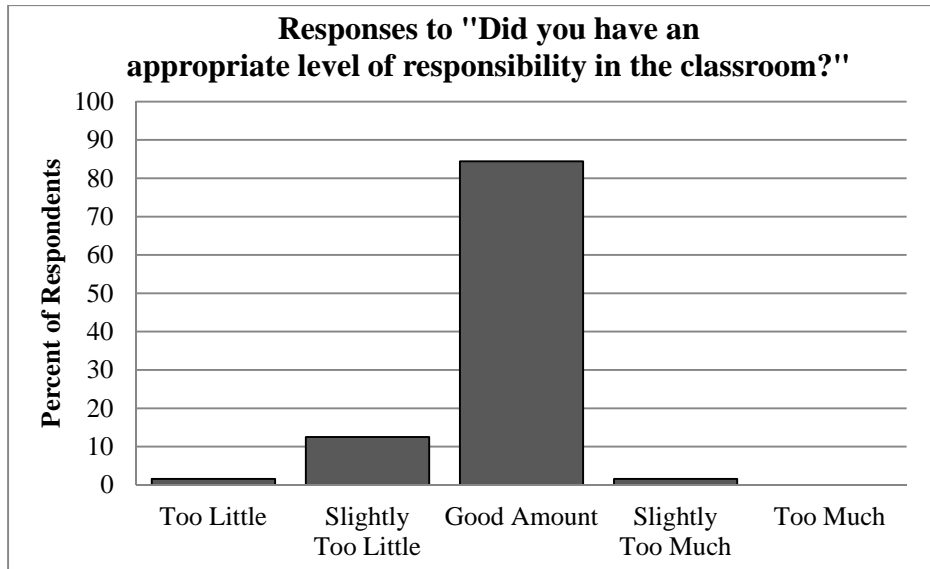


Figure 10: Responses to "Did you have an appropriate level of responsibility in the classroom?"

Stage 4: After Class Time and Reflection

Time Commitment Compared to Non-QMs. It should be communicated very clearly to QMs that the time commitment for the lab/activity is likely greater for them than for their peers. From the responses, 62% believed that they had a higher or much higher (maximum response) time commitment than their non-QM peers, as seen in *Figure 11*. Recall that a student should only serve as a Quality Manager once per term and for only one lab or assignment. As such, this commitment is typically a contained one-time investment and not an ongoing obligation.

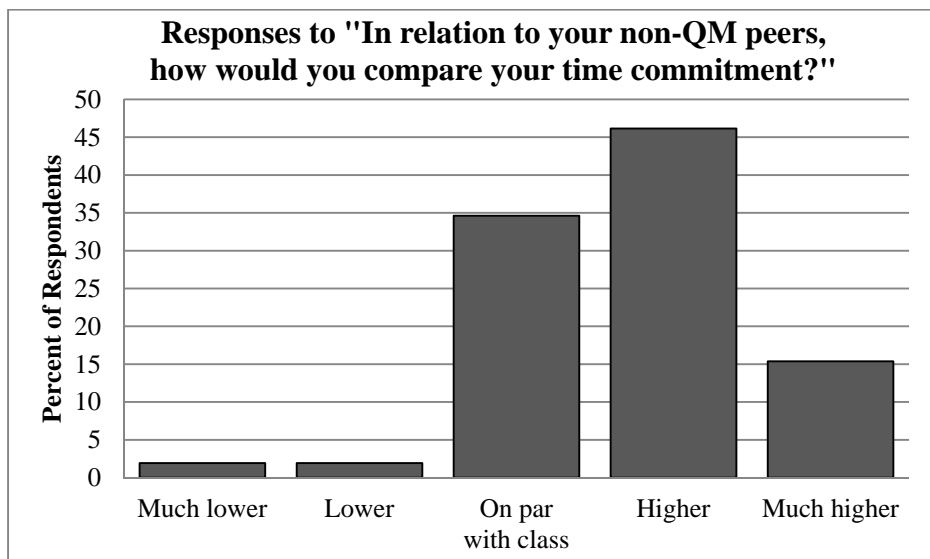


Figure 11: Response to "In relation to your non-QM peers, how would you compare your time commitment?"

Grade Assessment Compared to Non-QMs. Students were not typically motivated to become QMs because they assumed they would receive a higher grade. This is supported by results in *Figure 12* that show 60% of the respondents believed that they received a grade that was on par with their non-QM peers. Nearly all other, 39%, of respondents believed that they received a higher grade assessment than their non-QM peers. This perception matches the actual grade profile very closely. QMs are graded not only on content comprehension, but also for attending and contributing to any meetings as well as their critiques, edits, feedback, and in-class deportment. It is rare that a QM will earn a lower grade than the top 20% of the class. Usually it is because of not attending meetings, not having done the lab in advance, or having an unexcused lateness or absence in the QM service frame.

When asked if the students thought that they were more likely to be assured a higher grade, 56% responded “No” and 44% responded “Yes”. While students may not have been motivated by the assumption that they would receive a higher grade, many had confidence that they would earn one. This could be due to some likely outcomes of being a QM, including increased understanding of the material and development of interpersonal and/or teaching skills. Increased workload and time commitment also plays a role. Commentary from this question suggested that students assumed that QMs were graded on a different scale, but not automatically higher. This is, in fact, the case because of the meetings and feedback required of QMs.

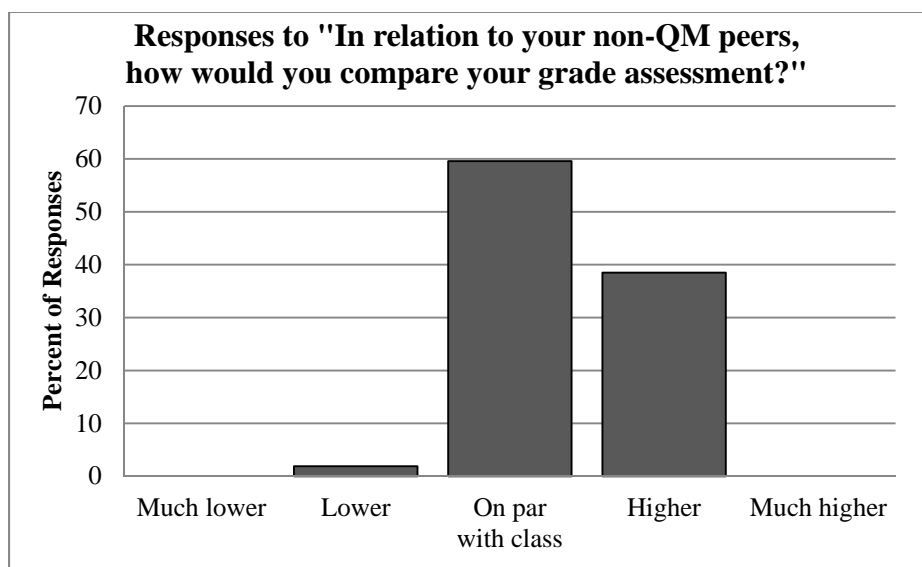


Figure 12: Response to "In relation to your non-QM peers, how would you compare your grade assessment?"

One student also conveyed the expectation that QMs' grades should be higher because the QMs' answers should be correct in order to properly teach it. Another student commented that it was *"more likely, but not necessarily expected."* Students felt more responsible for the work and felt more personally accountable and therefore believed that the typically higher quality output may receive more credit. There did not seem to be a relationship between the responses and the grade point average or year of graduation.

Understanding of Course Material. Students were asked to compare their understanding of the material to their non-QM peers. *Figure 13* shows that no QM thought that they learned less than the class, while 60% thought that they learned a "higher" amount than their non-QM peers and 20% reported a "much higher" amount learned (the maximum choice).

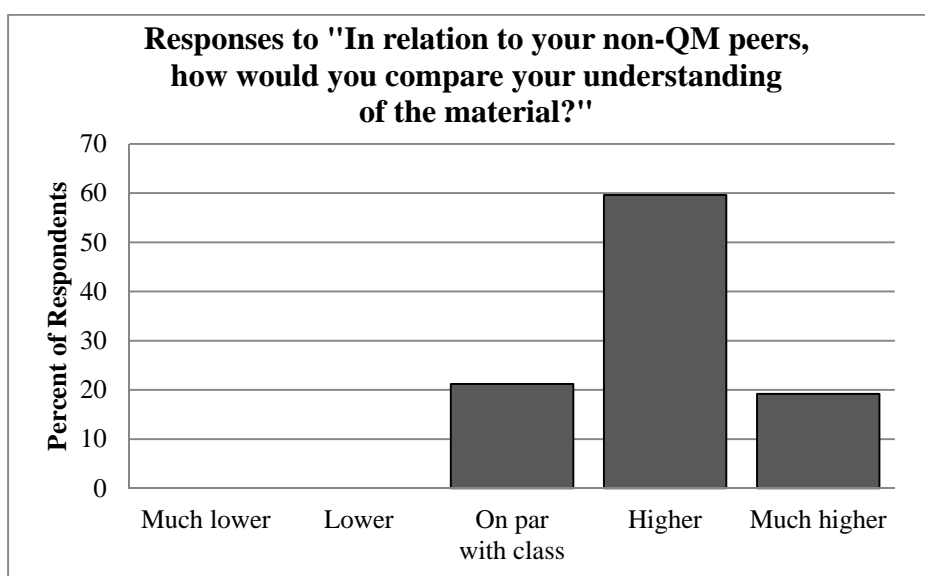


Figure 13: Response to "In relation to your non-QM peers, how would you compare your understanding of the material?"

Reflecting on Value Added. In determining where QMs felt that they added the most value, the activity that received the greatest number of respondents that selected "5" (the highest option) was the preparation phase. This includes testing the materials before the class as well as proofreading the assignment. Referring to *Figure 14*, the next greatest response was adding value during the classroom activity. While QMs may be responsible for being available outside of class on a limited basis, some QMs did not have this expectation and of those that did, 63% responded with a "3" or higher, meaning that they believed they added some value.

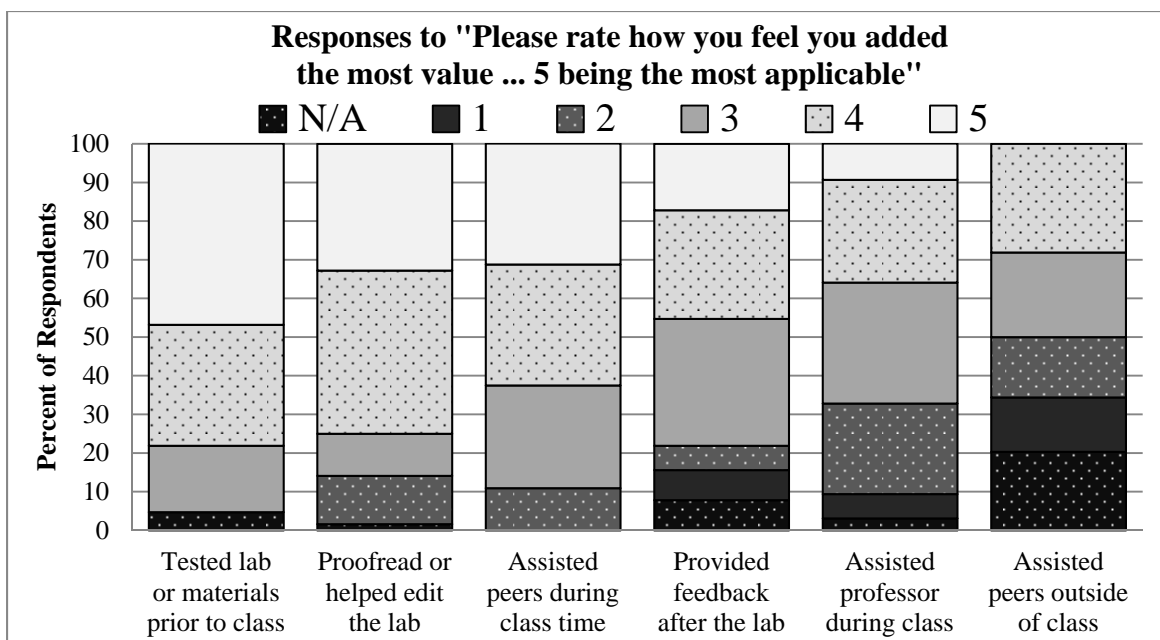


Figure 14: Responses to "With respect to each of the stages in being a QM below, rate how you added the most value to the class activity/lab, 1 being the least amount of contribution and 5 being the most."

Challenges. QMs may face challenges associated with their role. One student reflected, *"By experiencing the QM role and having to know the material in order to teach/help my other classmates I was able to understand the different challenges that come along with knowing material more thoroughly than others. I developed a new way of thinking about how to answer questions that helped guide my classmates, rather than simply give the answer to each question."* Challenges are encouraged during this process because they foster further development and growth as a student and professional. Understanding these challenges can help us improve the program, although we do not intend to eliminate all challenges but rather optimize the level at which the bar is raised for both QMs and the general classroom.

When asked to state what was most challenging about the QM position, as shown in *Figure 15*, 28% of the respondents believed that answering classmates' questions was challenging. QMs wanted to be prepared and knowledgeable enough to answer any question, which is a high expectation. Additionally, Quality Managers were challenged to answer questions via guiding the students towards the correct solution path rather than handing them the solution. As one student responded *"It was difficult knowing how much help to give the other students, knowing when to help and when to let them figure it out for themselves."* Proofreading and viewing the assignment from the instructor was also a challenge, noted many students. This reviewing required QM students to think outside of the box and explore other viewpoints in order to help produce a quality assignment for their contemporaries. Other challenges included the time commitment, learning material before the class did, or social or peer challenges. Social or peer challenges included balancing the role of friend versus helper and being respectful when answering questions.

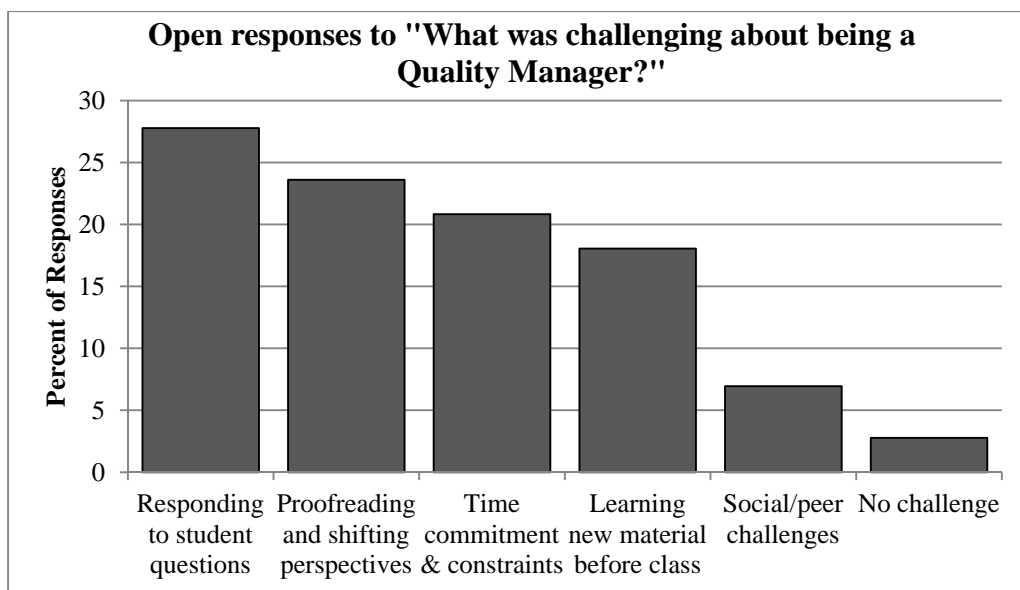


Figure 15: Open responses to "What was challenging about being a Quality Manager?"

Benefits and Successes. Our survey shows that Quality Managers experienced a multitude of personal gains throughout the Quality Manager process. One student states, *"I developed a better relationship with some of my peers I didn't know well, I gained respect and understanding for the professor, and I learned a lot about the material."* This study shows that there have been academic, personal, and professional gains. An exploration of the main benefits and how they compared to initial expectations is offered below.

While it was not explicitly examined in this research, it has been learned that several Quality Managers have used their selection and function as a QM in their portfolios or when seeking a job or position in a program. In doing so, they list the responsibilities and interactions that comprise the QM role. This anecdotal information has been garnered from participating faculty and students alike.

Students had initial expectations when they signed-up to become a QM and whether or not these expectations were met, all QMs gained something from the QM program. While 17% had initial expectations of having a better understanding of the lab/activity material, 29% of the open responses stated that they gained a better knowledge of the material. Other perceived gains included viewing the different perspectives of classmates and the instructor (18%), and the satisfaction of knowing that help was provided (17%), as seen in *Figure 16*.

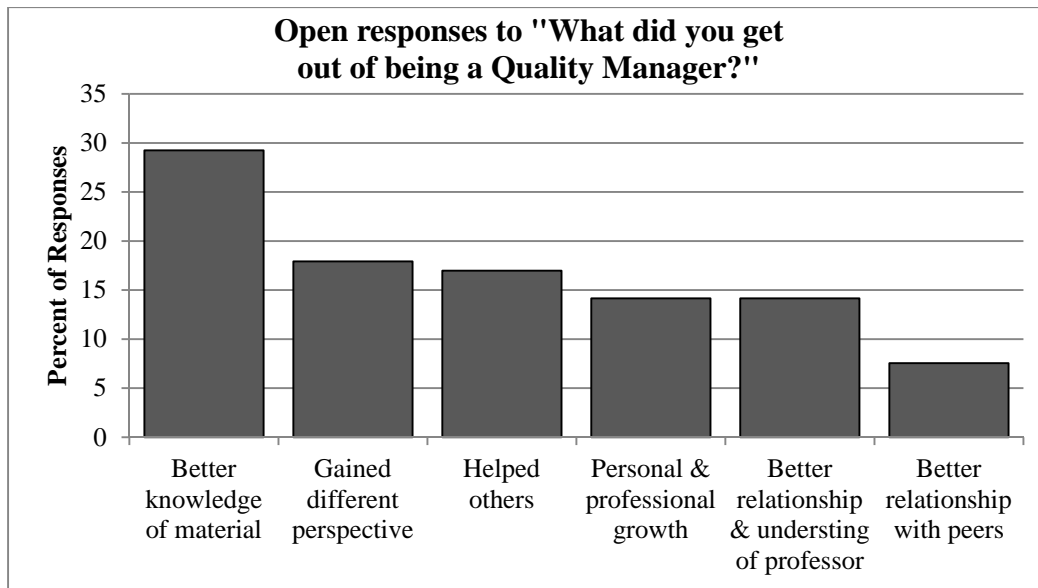


Figure 16: Open response to "What did you get out of being a Quality Manager?"

Grasping Course Material. Not surprisingly, most of the learning associated with course material occurred while preparing for labs/activities and testing them prior to class. *Figure 17* displays these results. The least amount of course material was learned from the QMs' classmates once the lab/activity was underway. Commentary from this question stated that being a QM motivated students to become more knowledgeable because they wanted to be able to answer all lab-related questions from classmates. Students were motivated to further analyze the lab and question how classmates might interpret wording within the assignment. QMs wanted to be prepared for their classmates. Quality Managers often found themselves delving deeper into the details of the lab in order to understand it completely. As one student stated "*Being a QM helped me to put my full attention into a lab and go through it more thoroughly than I may have otherwise.*"

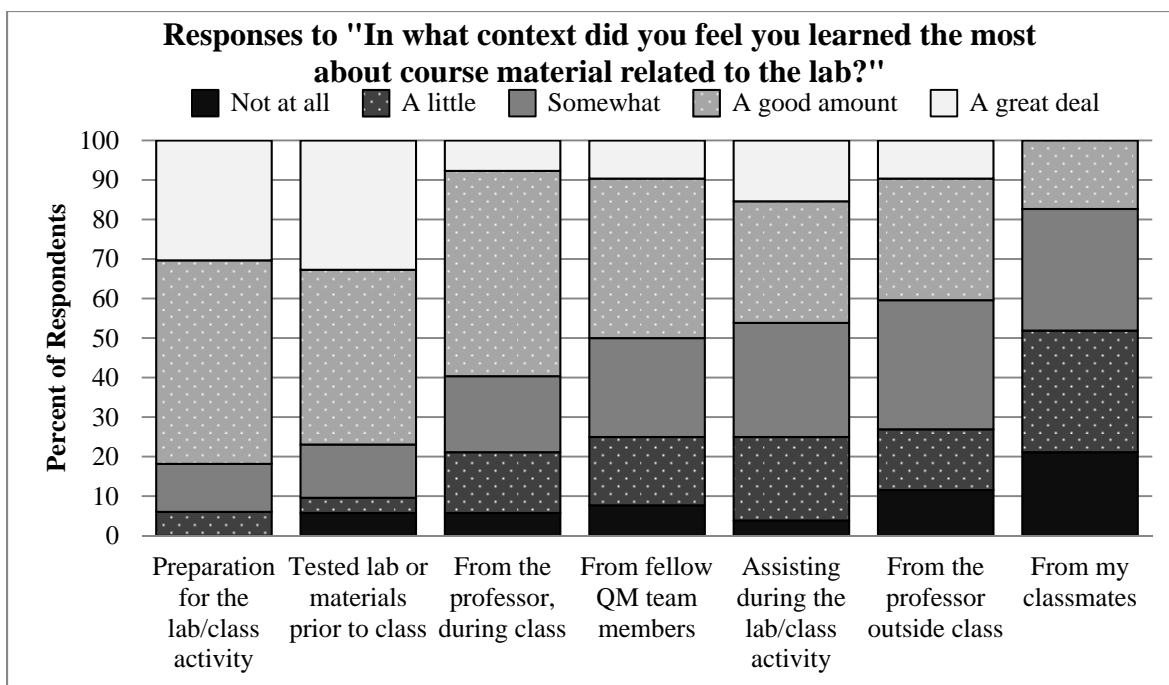


Figure 17: Responses to "While you were a QM, in what context did you feel you learned the most about course material related to the lab?"

Refining Personal Skills. While course material is a focus of the QM role, personal skills such as working on a team and interacting with peers in a unique role can also be developed. Most of the personal skills were developed during the lab/activity or from advance teamwork with their QM group. Students echoed the quantitative findings, shown in *Figure 18*, commenting that working with QM team members provided a context that influenced the development of personal skills. Students enjoyed working on different relationship levels with peers, QMs, the TA, and the instructor. Also, the QM experience enabled students to meet more class peers. This also helped communication skills, as some students required varied methods of explanation. Commentary referred to the challenge of balancing the QM role and serving as a helper rather than a specifically a being peer or functioning like a formal Teaching Assistant.

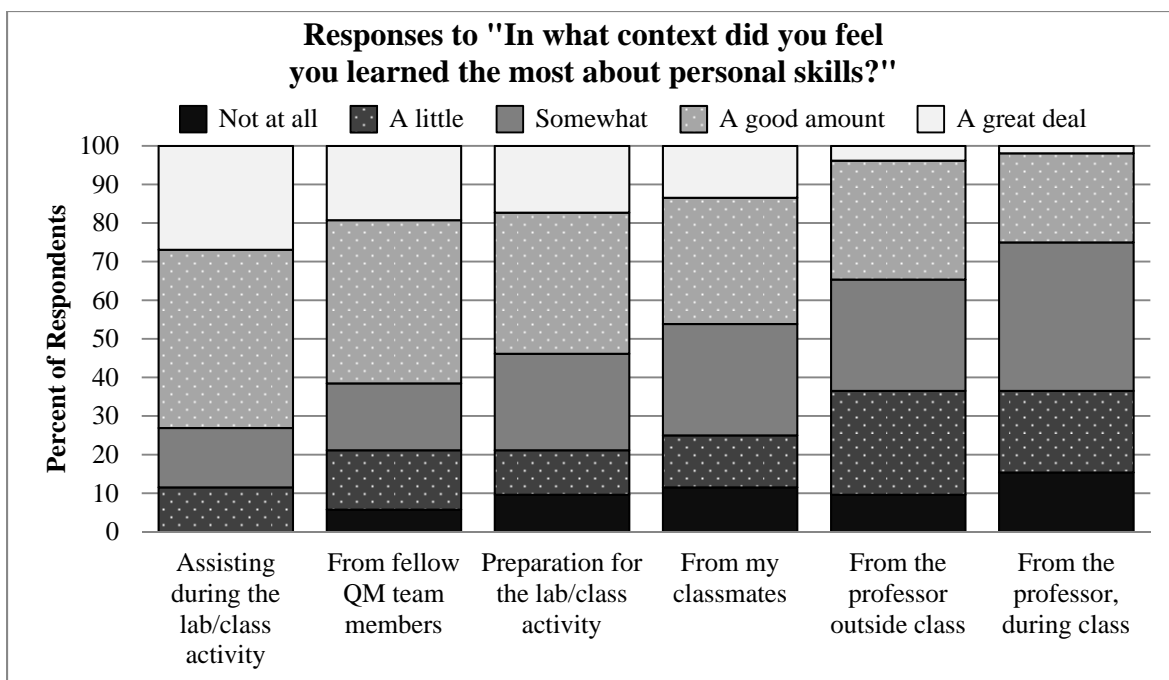


Figure 18: Responses to "While you were a QM, in what context did you feel you learned the most about personal skills related to the lab?"

Experiencing the Teaching and Learning Process. The Quality Manager program was theorized to be an alternative method for enhancing the learning environment while addressing the issue of decreased TSR without adjusting class sizes. Through feedback from the QMs themselves, it is clear that the perceptions of the teaching role are affected through a program such as this. Students realized the work and noteworthiness of an effective instructor and took these relationships more seriously. One QM responded in the survey,

"I can't imagine trying to teach a lab without QMs! How the professor would run the course normally with the faculty-to-student ratio would be extraordinarily challenging. Also, I understand more [after being a QM] that the professor is not always going to have the answers and shouldn't be expected to have all the answers but rather to be able to guide students as to where to find the answers."

The QM program provides undergraduate students with the opportunity to experience teaching and to guide learners. Refer to *Figure 19* for the profile of responses to this area of development. When asked about how they gained the most insight about the teaching and guiding process, 83% of the students selected that they learned a 'good deal' or a 'great deal' about this aspect of education while assisting during the lab/activity. Not surprisingly, much of the QM learning and modeling also occurred from the professor during the class as well as during the preparation for the lab/activity. Open commentary showed appreciation for how the instructor guided QMs on how to interact as a Quality Manager with their classmates. QMs felt that guiding the learning process was one of the challenges of being a QM, as it was difficult to lead a classmate towards an answer instead of simply stating the solution.

Quality Managers gained a better understanding of how others learn and comprehend material. This skill required developing and making use of varied techniques for explaining concepts to classmates. One student noted, *“Teaching is a tool that really does help you to grasp the concepts you yourself are attempting to advise on and, through this program, learn.”*

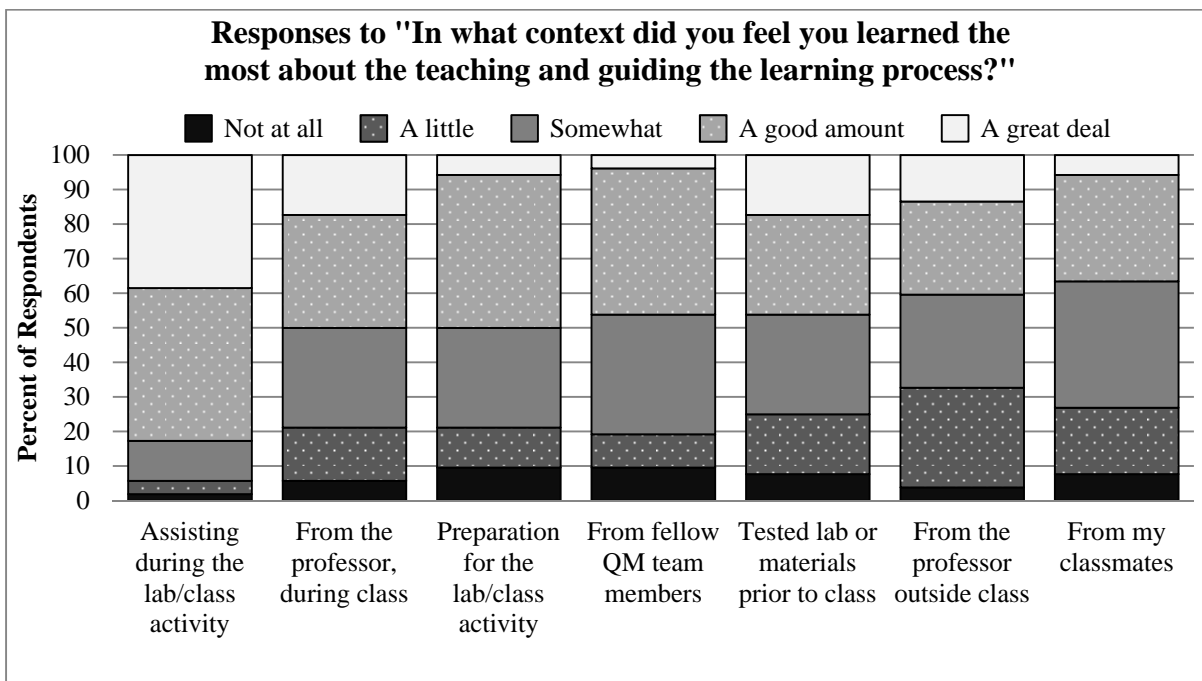


Figure 19: Responses to "While you were a QM, in what context did you feel you learned the teaching and guiding the learning process?"

In an open-response question, students were asked whether or not their perception of teaching or their instructor's role were changed because of their QM experience. Here, 85% of the respondents indicated a positive reply in terms of their respect and appreciation for the instructor. The remaining responses stated that their perspective was not changed.

In terms of how their perception of the professor and the teaching role was changed, 38% of the responses noted the realization behind the work and effort required and 30% stated that guidance as a teaching style is most helpful as seen in *Figure 20*. Students also became aware that conveying information can be challenging. The QMs also expressed an appreciation for professor's challenge –and thus their own to a degree– to master content knowledge and engage in continuous learning.

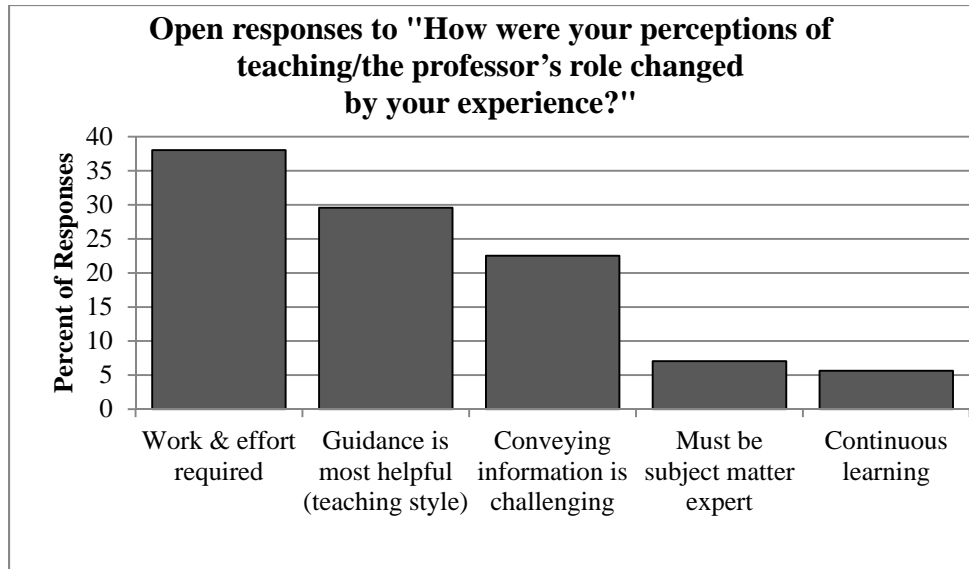


Figure 20: Open responses to "How were your perceptions of teaching/the professor's role changed by your experience?"

Overall Commentary. Finally, the QMs were asked to provide any comments they wished add in relation to their experiences and the Quality Manager initiative. In an optional open response question, as seen in *Figure 21*, about 50% of QMs surveyed provided additional insight on the program. Of those, 36% noted that the QM program was a positive experience and that they appreciated it and 22% also stated that the QM program was beneficial. An additional 36% suggested that the program be recommended and be implemented in other courses. Also, 7% of these unstructured responses referenced valuing the time with the instructor. Overwhelmingly, there was a positive response to the QM program by the QMs and there were *no* responses suggesting that the QM program had a negative or questionable impact on students, the courses, or the academic program.

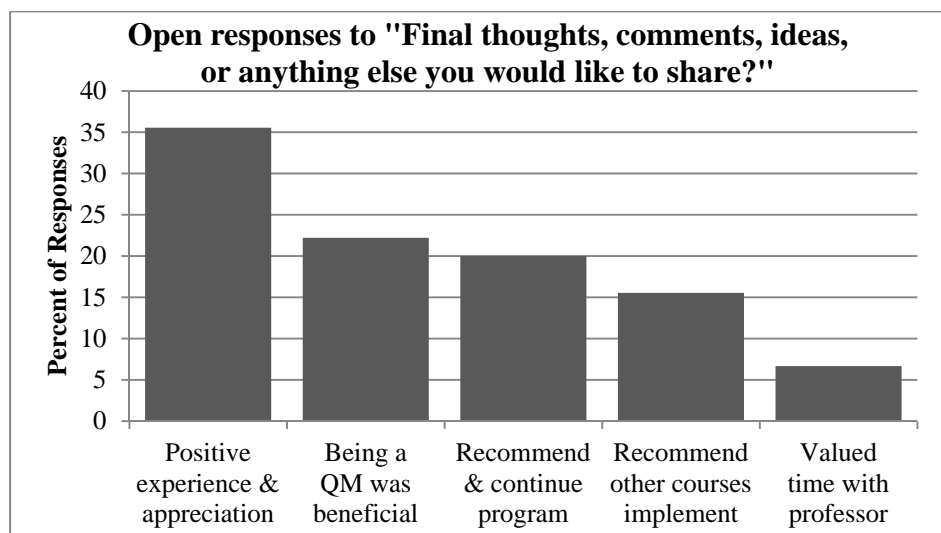


Figure 21: Open response to "Final thoughts, comments, anything else you would like to share?"

Improving the Quality Manager Role

Throughout the survey results, the QMs were invited to provide any critiques of the program. The critiques are noted and italicized below. Possible solutions have been suggested after each critique for further improvement.

- *Some students are pressured into becoming Quality Managers because their group members want to be QMs.*

For students who are familiar with a QM program, it might be beneficial to remind them to keep the opportunity to become a QM in mind prior to group selection. If the groups are instructor-selected, group selection could be based on which students are interested in serving in a QM role. It is possible to allow group members not to participate in the QM program –and this has been workable. In this case, it is advised to make exceptions for these students when the lab/activity occurs by having them temporarily join another team.

- *Some students felt that they had to learn class material prior to it being taught due to the assignment preparation.*

If a QM does not have enough background on the course material to complete the lab, the lead time of the assignment preparation may be too long. It is important that a student has a foundation of the subject; otherwise they may start to feel overwhelmed. It should also be clearly noted by the recruiting instructor that some advance or independent learning will likely occur.

- *Some students did not feel challenged.*

Most of the students who did not feel challenged were those who compared their labs that were earlier in the semester with later material that was more comprehensive. These students felt like they could have benefited more from a more challenging lab, but still understood their value as a QM.

- *Some students did not feel useful in the classroom setting.*

If a lab/activity assignment is extremely well prepared, QMs might find themselves standing around the classroom, unchallenged. While the QMs might not feel like they are useful, it is important for the instructor to explain this circumstance. In addition, a new paradigm was introduced by which one team member opens an electronic version of the assignment and makes live edits and suggestions as reported to them by the other QMs who are observing the class activities. This streamlines the final recommendation stage of being a QM.

- *Some students did not feel like their expectation to work with the instructor was met.*

Many students are motivated to participate in the QM program due to the ability to work with the instructor. If the students will be working with anyone else, such as the TA, during the preparation phase, it is important to convey this message to the QMs. Also, by design, the work-through on the assignment should be somewhat independent so as to emulate the future experience of the general students.

- *Some students were not aware of how their performance was evaluated.*

The evaluation procedure of the QM role should be clearly stated when the expectations and responsibilities of a QM are explained. A grading scale may be beneficial, but it may prevent students from thinking outside of the box and may not stimulate them to go beyond the QM role. However, QMs can be graded on their reliability, preparation, input, contributions, material comprehension, and more. Equally important is for the QMs to be fully present physically, emotionally, and intellectually for the lab/class experience.

- *Some students felt that a follow-up meeting between professor and QMs would be helpful.*

A follow-up meeting would give an opportunity to discuss future plans for the lab as well as a chance to provide feedback on student performance. Feedback from the QMs regarding the process is typically done through a worksheet or in person and professor feedback for the QM could be done in person or by another means.

Refinements and Implementation Guidelines

While it is important to keep ideas from *Improving the Quality Manager Role* in mind, there are some basic implementation suggestions that have been developed during this study. These guidelines are directed towards the instructor role and aim to build the QM role more effectively. The recommendations have been made based on the time-frame within the process.

Stage 1: During sign-up and selection. The selection process should be clear and the expectations of the QM role should be transparent. It is important for students to realize the motivations behind becoming a QM such as gaining a better understanding of the course material, personal skills, and the teaching experience rather than focusing on the aspects such as not having to complete a formal write up or assuming that a higher grade would be received. Depending on the nature of the class or assignment and the size of the class, teams of 2-4 QMs have worked best. When signing up as a group, students should not feel pressured by their teammates to participate, and accommodations should be made for the non-QM team members.

Stage 2: During preparation. The instructor should meet with every QM team during an appropriate lead time (typically within 2 weeks) at least once. The objectives of the assignment and the expectations from the QM should be evident. The grading policy should also be defined. The role of the QM should be explained and students should understand that they are a helper, or someone who provides advance and post-lab feedback and basic guidance throughout the entire lab/activity. Also, QM students should be encouraged to suggest modifications and clarifications within the written assignment. Students appreciate learning how to guide students rather than provide answers; instructors can help teach students these skills, explicitly and through modeling the desired behaviors. This can be done for each QM team, but as the QM program expands, it might be helpful to have an orientation for all participating QMs.

Stage 3: During class-time. Each QM should have a paper copy of the lab on which to take notes. They should also ensure that all participants have the materials needed to conduct the lab/activity. Student questions should be addressed first by a QM and then by the instructor, if necessary. The QMs will share the responsibility for the lab/activity within the classroom with the instructor.

Stage 4: After class-time and reflection. QMs should be able to provide feedback about the logistics of the lab/activity and areas that could be improved. It is preferred that this meeting occurs in-person, but could also be done electronically. QMs should be graded on the criteria defined during the explanation of the QM role.

Conclusion

Through this research and continuous study of the Quality Manager program, university faculty and students recognize the importance of teacher-student relationships and the need to keep up with new teaching and learning methods in a world that is rapidly growing through technology and complex content. A Quality Manager commented on the multi-faceted nature of the QM role stating the need to have *“a thorough understanding of the lab [assignment], both from a student's perspective and professor's perspective in our attempt to bridge the gap in their perception of the assignment.”*

While the original intent of installing a “more able” other in the classroom through the Quality Manager program was to enhance the overall academic benefits of the class at large, this study suggests that the “more able” peer also inherently experiences personal benefits and individual growth throughout the process. The descriptive statistics and content analysis methods used to interpret survey results during this study provide compelling support for the value of the QM experience. While there are challenges associated with the position and its administration, there are countless rewards. QMs benefit in a variety of ways such as by gaining a better understanding of the course material, enhancing their own personal skills, and/or discovering new perspectives in the teaching and learning process.

An instructor assists in enhancing the experience of a Quality Manager by guiding the QMs through the process. QMs should be aware of the classroom activity's objective, the time commitment, and the responsibilities of the QM role. Quality Managers also benefit from gaining insight on how to guide students towards the solution path without giving away answers. They learn how to anticipate and prepare for students' questions as well as work through unexpected, but welcomed questions. By taking time to develop a high quality assignment during the preparation phase, the overall classroom activity and learning experience will have noticeable benefits.

For educators, the message emerging from this work is that when the QM initiative is used in the proper environment and circumstance, everybody wins. Fostering a Quality Manager culture not only improves class material, but also enhances the relationship with QM and non-QM students alike. It allows an instructor to observe the classroom during a lab and better assess the level of comprehension –as opposed to engaging in mass management. In addition, using Quality Managers allows for the retention of some activities that could not otherwise be implemented single-handedly or with a single TA who is not immersed in the course. Also, an instructor has the opportunity to personally demonstrate an open attitude toward constructive critique his/her own continuous learning. Incorporating Quality Managers allows an educator to do what he/she hopes to do best: teach, guide, motivate, empower and serve as a model for students.

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