APPENDIX A
TA Survey

Please answer the following questions to the best of your ability. Your responses will be used to guide the TA training and for research purposes if you provide consent. If you do not feel comfortable answering a question, please leave the question blank.

1. What do you expect your role to be as a TA in General Chemistry labs?
2. What do you believe is the best way students learn?
3. How would you describe an ideal chemistry lab? What are the students doing? What is the TA doing?

Background Experiences

1. What year are you in your program? (i.e., 3rd year undergraduate, 1st year graduate)
2. If you are a graduate student, what prior degree(s) do you have? Please indicate the type of degree and school(s) you received each degree.
3. Have you had any prior research experience? Yes/No
    a. Please indicate the general type of research (i.e., biochemistry, organic synthesis)
    b. Where was the research conducted? (i.e., during undergraduate in a faculty research lab, at a pharmaceutical company)
    c. How long were you involved in the research?
4. Have you had any prior teaching experience? Yes/No
    a. What did you teach? (i.e., undergraduate organic chemistry, high school physics)
    b. When did you teach?
    c. What were your responsibilities?
5. What experience, if any, have you had with inquiry teaching?
    a. As a student?
    b. As an instructor?
6. What made you decide to major in chemistry (undergraduate TAs) or get a Ph.D. in chemistry (graduate TAs)?
7. At this point, what do you intend to do when you graduate?

Demographics

1. How old are you?
2. What is your ethnicity?
3. Are you an international student? Y/N
4. Male/Female

APPENDIX B
TA Interview Protocol

This interview is to follow up on your experiences during the TA training and your answers to survey questions. This interview will be recorded and the tape will be destroyed after the data is transcribed. No identifying information will be used in the data analysis and the data will only be analyzed for the purposes of my course project. **Alignment with social constructivism, TA characteristics, and EVT motivation framework in bold below.**

1. First, I'd like to follow up on your background experiences
    a. When did your initial interest in science begin?
    b. Tell me more about your research experience
    c. Tell me more about your teaching experience **(Social constructivism-prior experience)**
    d. What was your General Chemistry lab experience like? **(Social constructivism – prior experience)**
2. I would like to ask you more about being a TA
    a. How do you describe your role as a TA? **(TA perceptions)**
    b. How do you believe you (will) maximize student learning in your laboratory? **(TA teaching beliefs)**
    c. How will/do you know when your students understand?
    d. How do you believe your students learn science best?
    e. How do you know when learning is occurring in your lab?
3. I would like to ask you more about being in lab
    a. What, if at all, do you do to prepare for TAing? **(EVT – effort in learning)**
    b. Describe to me how you feel about the content associated with the lab? (Probe: How confident are you with your content knowledge?) **(EVT-expectancy)**
    c. Describe how you feel about interacting with students in lab? (Probe: What do you do when students are planning? Experimenting? Presenting?) **(EVT-effort in learning)**
    d. What are you most confident about in lab? **(EVT-expectancy)**
    e. What are you least confident about in lab? **(EVT-expectancy)**
4. You've been very helpful. Are there other thoughts are feelings you'd like to share with me to help me understand what the experience of being a TA has been like for you.

Appendix C
Confidence Coding rubric

Confidence Coding Rubric

Code	Confident	Reservations	Not confident
Content	Felt comfortable or sure of their content knowledge. Made efforts to address areas of weakness	Acknowledgement of areas where their content knowledge was not at 'expert'/in-depth level but still felt okay about the content associated with the labs	Did not know content at all and limited ability to work with students
Facilitation	Felt comfortable guiding students (i.e., using questions, moving them in a productive direction, not giving direct answers)	Difficult to not give answer but trying; worried about frustrating students (Some struggle present but positive about being able to facilitate)	Not comfortable with difficult situations (i.e., students completely lost, getting students back on track when going off in wrong direction, leading students too much) or explaining at students level. Not comfortable with guided inquiry
Student interactions	Felt comfortable making students feel comfortable and confident in lab. Interacting with students was enjoyable and fun.	Some struggle with interacting	Not comfortable with difficult situations (i.e., students not listening to TA, students pushing back to guided inquiry approach, students freaking out)

Appendix D
Teaching Beliefs Coding Rubric

	What can students learn in guided inquiry labs?	How would you describe your role?	How do you maximize student learning?
Deficit	**Focus on the limitations of inquiry. "Inquiry reduces amount of content/concepts learn." "Students couldn't achieve objectives of lab such as data analysis." "Student frustration limits learning." Not all students learn the same thing.**	**Focus on not doing anything. "Babysitter." "Caretaker." "Dealing with logistics."**	**Making learning easy for students by telling them the answers**
Traditional	**Focus on memorization and content knowledge. "Students memorize"**	Focus on information and structure. "Deliverer of information," **"answering questions," "Telling students what to do"**	Teacher provides information in a structured environment. "By using ppt presentations." "I use a textbook, a study guide, and we have it on the web."
Instructive	**Focus on laboratory skills, math skills or connecting concepts as learning outcomes.**	Focus on providing experiences. "I maintain student focus to minimize management issues." **Helping students with lab techniques**	Teacher monitors student actions or behaviors during instruction. "By looking at the student's responses." "I watch my students closely as they complete a lab."
Transitional	**Focus on learning critical thinking or problem solving skills.**	Focus on teacher/student relationship or student understanding. "I need to develop a good rapport with my students." "You have got to make the students feel comfortable or they will have a difficult time learning." "To guide the students in developing conceptual understanding and critical thinking skills." **Facilitate discussions**	Teacher creates a classroom environment that involves the student. "My encouraging them to do their own thinking" (Cognitive). "My building a positive, supportive environment" (Affective). **Engaging students in more in-depth discussions.**

	What can students learn in guided inquiry labs?	How would you describe your role?	How do you maximize student learning?
Responsive	**Focus on using NOS, applications of chemistry, excitement as vehicle for engaging students in learning skills and concepts.**	Focus on collaboration between teacher and student. "To set up my classroom so that my students can take charge of their own learning." **"Working with rather than over students."**	Teacher designs the classroom environment to enable students to interact with each other and their knowledge. "By using small group activities in which students hypothesize, predict, create, share and question." "By giving students the opportunities to defend their ideas in front of their peers."
Reform-based (needs to have enough detail to really know they mean this)	**Focus on NOS, applications of chemistry, or inquiry as learning outcomes instead of methods for engaging students. Students learn divergent thinking**	Focus on mediating student prior knowledge and the knowledge of the discipline. "I am a tour guide who helps students make sense of their surroundings in a manner that is consistent with what is known."	Teacher depends upon student responses to design an environment that allows for individualized learning. "Knowing that not all students learn the same, I have to think of different ways to organize the lesson." "By allowing students to choose their own vehicles to learn by." **"Allowing students to approach a problem in a different way, even if it's not going to work, and use it is a learning opportunity."**

	Know when students understand?	Evidence of student learning?	How do your students learn science best?
Deficit	**NA**	**NA**	**Struggling and frustration hinder student learning. By doing the minimum amount of work to pass.**
Traditional	When they receive information. "We covered it in class." "We covered it in different ways."	Determined by action of students during instruction. Emphasis is on order and attention as related to the student. "It is still and quiet at the end of the less." "They are paying close attention to lecture."	From the teacher. "By paying attention." "By taking good notes." **"Being told what to do."**

	Know when students understand?	Evidence of student learning?	How do your students learn science best?
Transitional	When they give an explanation or response that is related to the presented information. "When they talk about the presented knowledge in new ways" (Knowledge). "Their faces light up" "They get excited" (affective).	Determined through subjective conclusions about the student. "The students are actively engaged rather than passive." "The students write a reflection about their learning" (Cognitive). "I can tell by the look in their eyes." "It gets noisy" (Affective).	By using procedures/guidelines. "By doing hands-on activities." **"Applying lecture concepts to lab." "Applying/completing."**
Responsive	When they can utilize presented knowledge. "When they can clearly defend their ideas using evidence and examples they experienced." "When they can discuss new phenomena that they encounter in class."	Students interact with their peers or the teacher about the topic. Responses are limited or preliminary. "When students interact to solve problems." "When students are helping each other." "Students defend their ideas through the use of evidence and examples."	By encountering and interpreting phenomena. "They are challenged to create their own understanding to explain their generated data." "When they interact with one another as they try to explain their results." **""Learning concepts occurs within lab as students struggle with the information." "Building upon prior knowledge to create new knowledge."**
Reform-based (needs to have enough detail to really know they mean this)	When they can apply knowledge in a novel setting, or construct something novel that is related to the knowledge. "They can come up with questions or comments that represent an understanding of the topic. Often these questions use the knowledge in a new situation that they have not experienced in class." "One of my students used trigonometry to solve physics problems." "When students can question/dialogue in a manner that expands their understanding. They understand how a chemical reaction can be altered by the modification of an element."	Students initiate significant interactions with one another and/or the instructor about the topic. "Students can formulate thoughtful questions about the content." "Students seek other student's opinions about the content and what they know about an idea." "When students are challenging one another" **"Students come up with alternate ideas based on a synthesis of ideas."**	By eliciting, encountering, and constructing their ideas about phenomena. "When they have ownership over what they learn and how they choose to go about learning it." "They all learn differently, but they need rich experiences which allows each student to explore their notion of the experience and make sense of it in a new way." **"Students struggle with material in different ways to make sense of it." "Constructing."**

Bolded responses indicate modifications made to original rubric by Luft & Roehrig (2007).