

2018

## Identifying Undergraduate Student's Motivation to Attend Tutoring for General Chemistry Courses

Alexis C. Hyacinthe  
*University of Central Florida*



Part of the [Educational Sociology Commons](#)

Find similar works at: <https://stars.library.ucf.edu/honorsthesis>

University of Central Florida Libraries <http://library.ucf.edu>

This Open Access is brought to you for free and open access by the UCF Theses and Dissertations at STARS. It has been accepted for inclusion in Honors Undergraduate Theses by an authorized administrator of STARS. For more information, please contact [STARS@ucf.edu](mailto:STARS@ucf.edu).

---

### Recommended Citation

Hyacinthe, Alexis C., "Identifying Undergraduate Student's Motivation to Attend Tutoring for General Chemistry Courses" (2018). *Honors Undergraduate Theses*. 330.

<https://stars.library.ucf.edu/honorsthesis/330>



IDENTIFYING UNDERGRADUATE STUDENT'S MOTIVATION TO  
ATTEND TUTORING FOR GENERAL CHEMISTRY COURSES

by

ALEXIS C. HYACINTHE

A thesis submitted in partial fulfillment of the requirements  
for the Honors in the Major Program in Interdisciplinary Studies  
in the College of Undergraduate Studies  
and in the Burnett Honors College  
at the University of Central Florida  
Orlando, Florida

Spring Term, 2018

Thesis Chair: Erin Saitta Ph.D.

## **Abstract**

General Chemistry II is a common chemistry course that is required for professional school such as, medical, dental, optometry schooling. Considering that it historically has a high drop, fail, withdrawal rate, it is surprising that less than 10% of students in chemistry II attend tutoring at the Student Academic Resource Center (SARC). In this tutoring center, sessions are led by students who have excelled previously in that specific course. The objective of this research is to investigate the relationship between student motivation and attendance in SARC peer tutoring sessions for chemistry II. More precisely, to better understand the connection between those who have a motivation of getting a good grade and learning the material and those who attend tutoring. In order to gain insight on a student's motivation to attend sessions in SARC, a survey was distributed to those taking the class currently. Two modes were used including paper survey and online. Findings from this investigation will lead to suggestions to increase SARC chemistry tutoring attendance which could positively impact the success of STEM students on UCF's campus.

## **DEDICATION**

To my family, thank you for pushing me to reach for the stars.  
To SARC, thank you for providing me the opportunity to help several students.  
To Dr. Saitta, thank you for being an amazing mentor.

## TABLE OF CONTENTS

Introduction.....	1
Review of the Literature .....	2
Peer Tutoring In Higher Education .....	3
Tutoring Center Effectiveness.....	4
Motivation and Student Achievement.....	5
Culture of Tutoring in Chemistry.....	6
Methods.....	7
Outline.....	7
Validating the Instrument.....	8
Results.....	9
Discussion .....	13
Limitations .....	14
Conclusion .....	15
Appendix A.....	17

**LIST OF TABLES**

Table 1. Student’s Likes and Dislikes Regarding SARC ..... 12

## **LIST OF FIGURES**

Figure I. Expected Grade For Students Who Previously Attended SARC.....	10
Figure II. Expected Grade For Students Who Have Never Attended SARC .....	11

## **Introduction**

As of 2016, the student population at University of Central Florida (UCF), reached about 64,000 students. Due to UCF's large size, many course lectures are held in large auditoriums. Classes can reach up to 1700 students and many of the general education science course sections reach more than 400 students.

Tutoring centers have been implemented on university campuses to help those students who may struggle in a course, especially large classes. Many of the subjects that are supported with tutoring include Science, Technology, Engineering and Mathematics (STEM) courses. At the University level, these are the courses in which students often struggle with.

On the campus of University of Central Florida (UCF), the Student Academic Resource Center (SARC) was opened to assist students with their academic needs. At UCF, there are several places to receive free, extra help for those students who may be struggling in a course. Most notably, SARC provides free peer tutoring. These are free group sessions led by a student leader for a specific subject. SARC offers peer tutoring for a number of different courses several hours within a week, sometimes multiple tutors, focusing on the courses that have shown to have the highest DWF (drop, withdraw, fail) rates.

Through tutoring, students learn new/different ways to study the course material, as well as, study techniques they may not have discovered when studying on their own. Those who attend tutoring tend to do better in the course than those who do not attend at all. Despite the fact that it is a highly effective service, only a small percentage come to tutoring.

In an effort to spread the word about SARC, student outreach takes place the first week of classes for every course that is granted tutoring. Normally, the tutors introduce themselves and make the announcement in class. Historically, this is the only time outreach is made, aside from advertising on the SARC website. Fluctuations in attendance is dependent on other unknown factors.

The purpose of this research is to understand what motivates students in STEM disciplines to attend tutoring, in particular, SARC tutoring for chemistry. CHM 2046 (Chemistry Fundamentals II) is a course that is required for medical, dental, optometry schooling etc. It is also a class that historically has a high drop, fail, withdrawal rate, but yet, less than 10% of those in the classes actually attend tutoring. Student outreach during the first week of school can only do so much, so what can motivate the students who do not reach out and attend tutoring?

## **Review of the Literature**

Many students struggle in post-secondary school even if they were successful in high school. This is evident because 60% of students drop out during the first academic year of their undergraduate career (Arco-Tirado et. al, 2011). Tutoring has the ability to reduce this percentage. It was found that the number of weeks' students are present and active in tutoring have a direct correlation of performance in the course (Colver and Fry, 2015). Considering this, it is important to review peer tutoring in higher education, tutoring center effectiveness, motivation and student achievement, and culture of tutoring in chemistry when identifying why students go to tutoring.

### *Peer Tutoring In Higher Education*

Peer tutoring is a strategy of learning support which utilizes other students to provide academic assistance to those peers that are struggling (Chan et. al, 2016). Peer tutors are typically undergraduate students who have performed well previously in the specified course. Peer tutoring in universities often involves both group and private tutoring in several locations on campus. As per Janet Colvin's research (2007), peers are often considered the most influential people in undergraduate education. Some students even believe peer tutors were better than staff tutors at understanding their problems, being interested in their lives, and having less authoritarian personalities (Moust and Schmidt, 1995).

Tutoring can range from lecturing to sharing information in a group setting (Colvin 2007). The function of peer tutoring focuses on the benefits from removing the typical hierarchical structure in learning, for instance, in a classroom, the teacher-student model (Colvin 2007). Not only are tutors helping attendees with the understanding of the class material, but also, peer tutors can act as mentors/advisors/counselors, because of their previous experience when taking the course. Through tutoring, it is possible to continue classroom discussion, evaluate how the attendees are retaining the information, resolve specific problems they may have, encourage independent learning, and help the attendees develop the study skills necessary for them to pass the course, for example, confidence (Colver and Fry, 2015; Bunce, et. al, 2016).

Class size on the undergraduate level has the potential to affect how much is learned by the students in the course (Ehrenberg, et. al 2001). From the article, "Class Size and Student Achievement," Ehrenberg and colleagues mention that class size can affect how much the students learn due to classroom behavior or teacher's ability to handle such a large class

capacity. In theory, smaller class size should allow for more individual attention. For large universities like UCF, peer tutoring provides a resource that can alleviate some of the issues caused by large classes.

### *Tutoring Center Effectiveness*

There are a large number of schools across the nation that cannot afford to make individual tutoring readily available for students, at the university expense. Because of this, tutoring centers or labs often provide tutoring support to multiple students simultaneously, free of cost (Cooper 2010). Cooper mentions two types of tutoring, (1) Drop-in tutoring and (2) Fixed-role tutoring. These two kinds of tutoring work best for different types of subjects. Students in a math class may benefit more from drop-in tutoring, whereas other courses may work better in a fixed-role tutoring setting. Drop-in tutoring is defined as a study area where students can freely come and go and ask tutors for help in different topics (Cooper 2010). Normally, the tutors that are present in drop-in tutoring are masters of all subjects the students may come in for. For example, in a math tutoring center, the tutors may have advanced knowledge in algebra, trigonometry and pre-calculus. Fixed-role tutoring, however, is set up in the same way as the Student Academic Resource Center (SARC). Unlike drop-in tutoring students are able to attend fixed sessions for the course they are having difficulties in. Students are then able to ask the peer tutor leading the session questions regarding that subject. The peer tutors are students, normally more experienced juniors and seniors lead sessions for those students that need help in the same course (Cooper 2010). After receiving an A in the course and a faculty recommendation, these students are considered to be tutors for the respective subject

(Colver and Fry, 2015). In addition, the peer tutors in the centers are all required to complete an international certification from the College Reading and Learning Association (CRLA) training program, their first semester of work (Cooper 2010; Colver and Fry, 2015).

### *Motivation and Student Achievement*

Considering free tutoring is available for students and not many attend, how is it possible to make these services attractive and beneficial to those students? A study that reviewed freshmen at a small northwestern university, in fact, found that those who visited the tutoring center more than 10 times in a semester their first year, statistically had higher rates of persistence in the course and were more likely to be in good academic standing, rather than the students who did not visit the tutoring center (Cooper 2010). Unfortunately, limited research is available to give insight as to what motivates students to visit a tutoring center.

In order to study motivation, it is important to determine an operative definition. Motivation is defined, as the practice whereby goal-directed activity is encouraged and maintained (Hernandez et. al, 2013). Without motivation, university students have the possibility of struggling in their classes. When it comes to the success of university students there are many factors that promote or hinder it (Donohue and Wong 1997). Information about which of these factors that influence motivation in STEM careers are notably lacking (Hernandez et. al, 2013). However, some research suggests that student satisfaction is necessary for continued motivation because achievement motivation and satisfaction with college life have been linked to a student's performance (Donohue and Wong 1997). If students are satisfied with their university

experience then they would develop a level of motivation necessary to be successful. Tutoring can help with a student's success in different courses, therefore it is necessary to determine what may motivate them to attend.

### *Culture of Tutoring in Chemistry*

It has been found in 2011 that 38% of students who begin their undergraduate experience as a STEM major will graduate with a STEM degree (Musah and Ford). Part of thinking about what will increase graduation rate, is thinking about how we can help students succeed. Previous studies have shown that peer-led sessions can enhance student performance specifically in chemistry (Kulantunga, et. al 2013). It is necessary to offer tutoring for those in general and organic chemistry courses, because these courses are required for not only those pursuing a degree in chemistry, but also for students, who in the future want to join the health field (Musah and Ford, 2016). These lower-level courses will be seen again in future standardized tests that are required for many professional schools.

Just offering tutoring in these disciplines isn't enough. There is a need to understand who goes to tutoring for chemistry and why. It was found that those students who have received higher grades in courses have chosen to study resources that matched the assessment for the class, such as previous exams (Bunce, et. al 2016). Surprisingly, these were not the same students who sought out face-to-face help (Bunce, et. al 2016). Face-to-face help includes other resources, such as office hours, tutoring, TA hours and other peers. In fact, research found that it was the students who receive lower grades that often sought out extra help in these terms (Bunce, et. al 2016). It is possible to note that it is necessary for those who do receive those lower grades

may need a different outlook on the material compared to lecture. For them, face-to-face help including tutoring works. According to these results, it should be expected that the majority of attendance in chemistry tutoring consist of those students that might of performed poorly on previous exams or quizzes in the course. Perhaps even utilizing old exam questions in tutoring may actually benefit those who tend to perform lower in the course.

## **Methods**

### *Outline*

The objective of this research is to investigate the relationship between motivation and student attendance in SARC peer tutoring. It is expected that those who have a motivation of receiving a good grade in the course and motivation to learn the material will be those who attend tutoring. It is hopeful that this relationship will allow us to gain insight on what motivates students to seek extra help in chemistry classes

In order to gain insight on what motivates students in CHM 2046 to attend tutoring, surveys were distributed to provide their perception regarding their success for the course. Research took place at the UCF Orlando (Main) campus during the Spring 2018 semester, following the student's first exam. The survey was completed by a total of 388 students enrolled in two sections. In one section the students received paper surveys (273 completed) and in the other section the students had the opportunity to complete an online survey (115 completed) and had one week to complete it. The paper survey took students approximately 10 minutes to complete.

The survey that was given to students was not only voluntary, but anonymous as well and can be found in Appendix A. When viewing the survey, an example of quantitative data in the research, would include numerous questions based on a scale from 1 to 5. 1 meaning strongly disagree, 2. Somewhat disagree, 3. Neither agree nor disagree, 4. Somewhat agree, 5. Strongly agree. These closed-ended questions will undergo statistical analysis, when answered, which will then result in a numerical representation. Qualitative data, on the other hand, would include those free response questions found within the survey. For example, “What do you like most about SARC?” These open-ended questions would allow the voice of the participants to be heard.

Due to the mixed method design, the data received will be concurrent. Both qualitative and quantitative data would be used to validate the research question at hand. The goal is to determine what would motivate students to attend and through the questions present in the survey, it will be possible to achieve this.

### *Validating the Instrument*

Survey questions were modified from an existing instrument used by the Student Academic Resource Center, to assess the supplemental instruction (SI) program. The modified survey was subjected to expert evaluation and student pilot run to gather evidence of validity. The research was analyzed according to a mixed method design which was chosen because it focuses on both qualitative and quantitative methods.

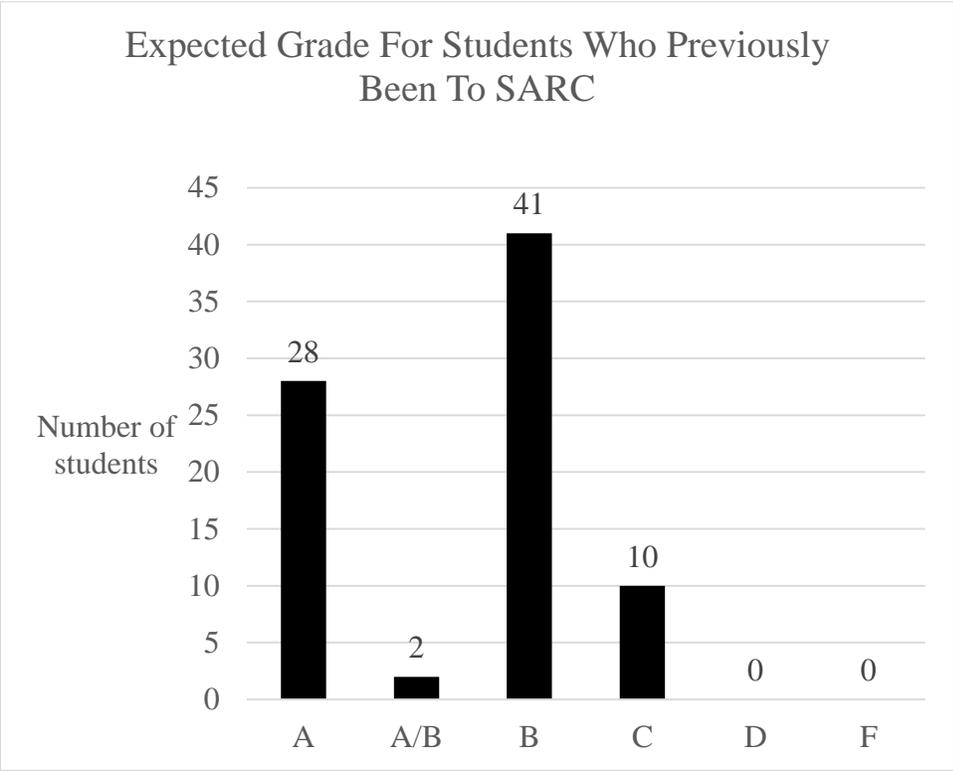
The instrument was validated by multiple subjects. The template of the survey was first sent to both professors to receive feedback. All changes made the survey can be found in

Appendix B in an italicized format. One professor suggested to add a question to the last page of the survey (Appendix B). The survey was then sent to a tutor who currently covers this exact course and has been for multiple semesters in the past.

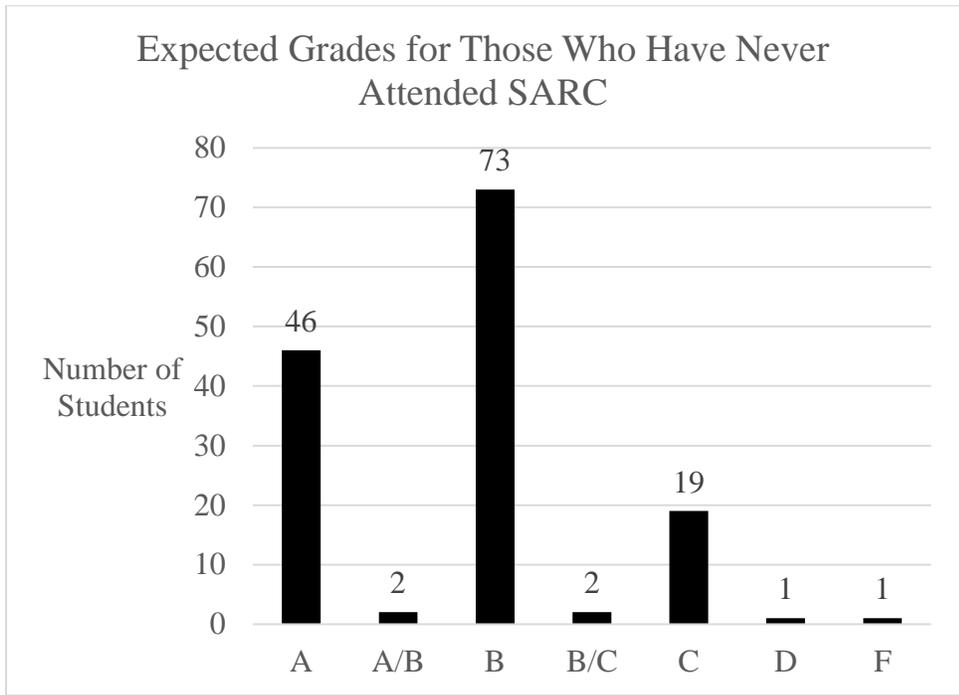
After making these changes, the survey was then administered to 4 students currently enrolled in the CHM 2046 Lab and not currently enrolled in the CHM2046 Lecture. The survey was easy for the subjects to follow, but they gave a couple of suggestions regarding formatting. Following this procedure, the survey was bolded in certain areas, for ease of completion.

## **Results**

The data of expected grades were inputted into two different bar graphs (Figure I and II). Figure 1 shows the results from the students who have previously attended SARC, while the second figure portrays the expected grades from students who have not previously been to SARC. These expected grades were all self-reported.



**Figure I. Expected Grade For Students Who Previously Attended SARC**



**Figure II. Expected Grade For Students Who Have Never Attended SARC**

To validate if there is a value in attending tutoring, the top five student’s likes and dislikes regarding SARC were coded for themes and then inputted into a table (Table 1). These responses came from students who have attended SARC for any course previously. The numbers in the table represent how often the topic was mentioned in the survey responses. The most popular response for what students like most about SARC peer tutoring was that SARC was more personal. The second most popular response was the structure, which included, interactive learning, step-by-step explanations, setting and pace. The most popular response for what students like least about SARC was specifically the schedule. There were several miscellaneous responses that could not be coded for a specific theme. This included, but was not limited to, “not effective,” “have to come with questions,” “no answers for practice problems,” etc.

Out of the 71 students who expect to receive an A or B and have been to SARC previously for another course, 86% claim they will attend SARC for this course. In hopes to see an increase in test scores, learn the best way to read a textbook, or to better understand the chemistry concepts. Ten students, however, will not attend because they prefer to study alone, schedule does not permit, and/or they have other sources for outside assistance.

**Table 1. Student's Likes and Dislikes Regarding SARC**

Student's Likes Regarding SARC		Student's Dislikes Regarding SARC	
More personal	17	Schedule	17
Structure	12	Crowded	8
Extra Help	12	N/A	6
Help with Specific topics	8	Variability of tutors	5
Grasp better understanding on topics	7	Miscellaneous	26

23 students never attended SARC for a course previously and believe they may receive an overall grade of a "C" or below in this course. For those who plan on attending SARC, they would go to increase test scores, better understand chemistry concepts, and better understand the math related to the course. For those who do not plan on attending SARC for this course, it is because they prefer to study alone, their schedule does not permit, and/or they have other sources for outside assistance. To add, out of the 23 students who believe to get a lower grade, majority believe it is necessary to attend tutoring for the course, but have no desire to attend.

36% of the students in the course reported they have previously attended SARC, while the remaining 64% of the students reported they have never attended SARC previously. 94% of those students who have never been to SARC are aware that there is free tutoring available for this course.

## Discussion

This class is a requirement for many health professional schools post undergraduate education. Many of those schools prefer that a student receives a grade of a “C” or higher in every required course, as well as, maintain a competitive science GPA. Because of this, success in this course has been defined as receiving a grade of an “A” or “B.” There is a limitation, however, when looking at the grades the students expect to receive. Grades were in fact self-reported and not their actual grade. Out of those who been to SARC previously and believe to be successful in this course, majority will still attend SARC to either increase test scores, learn the best way to read the textbook or to better understand chemistry concepts.

There were 71 students who expect to receive an “A” or “B” and have previously attended SARC for a different course, it can be deduced that more than 85% believe it is necessary to continue attending SARC for this course. This is evidence that the students who attend tutoring for high achievement value the experience they receive at SARC. With the same population (those who have previously been to SARC), two of the free response questions asked in the survey were coded for common themes and placed in a table (Table 1.) What most of the students valued about SARC included the idea that it was more personal and there was a strong structure where they can receive extra help. A common dislike regarding SARC was the schedule. Some even suggested that SARC offer weekend times to the schedule. This dislike also was a common reason why many (those who have been and have not been previously) would not be attending SARC for this course.

There are 23 students who have not been to SARC in the past and expect to be not as successful in the course as their peers, by receiving a grade of a “C” or below. Out of those 23

(Table 2.), the majority believe that adding tutoring to their schedule will be necessary, yet the majority lack the desire to seek outside help for this course. This finding was interesting and further proves the necessity of figuring out how to motivate students to attend tutoring for this course. Developing marketing strategies to adhere to what these struggling students may want to get out of SARC would be the best idea.

The majority of students (64%) reported on the survey that they never been to SARC for another course, however, 94% of everyone who responded is aware that SARC does provide free tutoring. If students do attend SARC for this course it may be their first experience with SARC. This makes outreach even more critical. If the majority of the students mentioned in the survey that they like the fact that SARC provides a more personal setting. This would be a great addition to the outreach speech. The class size for this class can be between 400-500 students. Students could be intimidated by the fact that it is a large class and may be hesitant to ask questions during class time. During marketing that statement should be said. "This class is large, you may have a lot of questions, come down to SARC for a more 1 on 1 experience to lessen the intimidation."

### *Limitations*

Although, 388 surveys were received, only the paper surveys were reviewed. The section that did the online survey had a Supplemental Instruction (SI) Leader assigned to the class. An SI Leader is similar to a peer tutor; however, they are not allowed to re-lecture or give direct answers. They attend each lecture and hold 4 sessions a week and guide students to answers for a problem or topic they may be struggling with. Since a SI leader is not the same as a peer tutor,

the results from the online survey may be skewed. Some students might have confused the idea of a peer tutor with an SI leader. In addition, the paper surveys had a higher response rate of 59.3% compared to the online survey that had a response rate of 33.6%. For this reason, only the paper survey data was analyzed. In addition, approximately fifty people misinterpreted the paper survey and those results were not included in the analysis.

## **Conclusion**

This means that most students enrolled in this course are aware SARC tutoring exists. If attendance is low then maybe marketing strategies need to be adjusted to better adhere to students and spark their interest in attending. Marketing of SARC for this course may be more effective if it emphasized the reasons why students (both engaged and disengaged) value the most. During outreach, it should be said that in tutoring for this course students can benefit from increased test scores, better understanding on both concepts related to chemistry and the math related to the course, as well as, be able to learn the best way to read the textbook.

The class size for this course at UCF is normally 400-500 students, making this a large class in an auditorium. Yet, many of the responses from the students reflected that peer tutoring creates a more personal setting and that is something they enjoy most about it (Table 1). SARC should market to students that there is a chance to learn in a smaller group.

In future research, survey format and delivery mode should be adjusted to get a better response and less invalid submissions. Further analysis can include what would motivate

disengaged high achieving students to try tutoring. Future data could also be collected of expected grade, actual grade and then compared to attendance in SARC.

## **Appendix A**

HIM Research Survey  
Principal Investigator: Dr. Erin Saitta; Co-investigator: Alexis Hyacinthe

All responses are anonymous and will not affect your grade in this course.

**Start Here:**

What grade do you expect to receive in this course?

A      B      C      D      F

**Column A: Fill out this side if you HAVE attended SARC for peer tutoring previously for any course at UCF**

For the following questions:

1. Strongly disagree
2. Somewhat disagree
3. Neither agree nor disagree
4. Somewhat agree
5. Strongly agree

SARC peer tutoring has been helpful in relation to my test scores in previous classes

1 2 3 4 5

SARC peer tutoring has helped me better understand the course content in previous classes

1 2 3 4 5

SARC peer tutoring has helped me improve my study skills for previous courses

1 2 3 4 5

I have noticed a change in my study habits since attending SARC peer tutoring for previous courses

1 2 3 4 5

Continue to next page

**Column B: Fill out this side if you HAVE NOT attended peer tutoring at SARC for any course at UCF**

For the following questions circle yes or no:

Did you know SARC offers **FREE** peer tutoring for this course?

Yes No

Do the tutoring times align with your schedule? (Tutoring times are at the end of survey)

Yes No

Do you think adding tutoring to your schedule will be necessary for success in this course?

Yes No

Do you have any desire to seek outside help for this course?

Yes No

Continue to last page

What do you like most about SARC peer tutoring?

What do you like least about SARC peer tutoring?

Have you lost interest in attending SARC sessions? (Circle One)

Yes    No

If yes, why?

If you worked for SARC as a peer tutor, what would you say/do to get students to attend sessions?

Continue to next page

Do you plan on attending tutoring for this course? (Circle One)

Yes    No

If yes, why? (Select all that apply)

- To increase test scores
- To learn how to better take notes
- To compare notes with peers
- To learn how to organize information regarding the class
- To learn how to remember information
- To learn the best way to read the textbook
- To learn problem-solving strategies
- Other:

If no, why not? (Select all that apply)

- My schedule does not permit
- I do not need extra help
- Peer tutoring is not helpful
- I have other sources for outside assistance
- I prefer to study alone
- I commute
- Other:

\

**HIM Research Survey (Final Draft)**

Principal Investigator: Dr. Erin Saitta; Co-investigator: Alexis Hyacinthe

All responses are anonymous and will not affect your grade in this course.

**Start Here:**

What grade do you expect to receive in this course?

A      B      C      D      F

**Column A: Fill out this side if you HAVE attended SARC for peer tutoring previously for any course at UCF**

For the following questions:

1. **Strongly disagree**
2. **Somewhat disagree**
3. **Neither agree nor disagree**
4. **Somewhat agree**
5. **Strongly agree**

SARC peer tutoring has been helpful in relation to my test scores in previous classes

1 2 3 4 5

SARC peer tutoring has helped me better understand the course content in previous classes

1 2 3 4 5

SARC peer tutoring has helped me improve my study skills for previous courses

1 2 3 4 5

I have noticed a change in my study habits since attending SARC peer tutoring for previous courses

1 2 3 4 5

**Continue to next page**

**Column B: Fill out this side if you HAVE NOT attended peer tutoring at SARC for any course at UCF**

For the following questions circle yes or no:

Did you know SARC offers **FREE** peer tutoring for this course?

Yes No

Do the tutoring times align with your schedule? (Tutoring times are at the end of survey)

Yes No

Do you think adding tutoring to your schedule will be necessary for success in this course?

Yes No

Do you have any desire to seek outside help for this course?

Yes No

**Continue to last page**

What do you like most about SARC peer tutoring?

What do you like least about SARC peer tutoring?

Have you lost interest in attending SARC sessions? (Circle One)

Yes    No

If yes, why?

If you worked for SARC as a peer tutor, what would you say/do to get students to attend sessions?

How would you improve SARC tutoring?

**Continue to next page**

Do you plan on attending tutoring at **SARC** for this course? (Circle One)

Yes    No

If yes, why? (Select all that apply)

- To increase test scores
- To learn how to better take notes
- To compare notes with peers
- To learn how to organize information
- To learn how to remember course information
- To learn the best way to read the textbook
- To better understand the math related to the course
- To better understand the chemistry concepts
- Other:

If no, why not? (Select all that apply)

- My schedule does not permit
- I do not need extra help
- Peer tutoring is not helpful
- I have other sources for outside assistance
- I prefer to study alone
- I commute
- Other:

### **SARC Tutoring Times for Spring 2018**

**Alexis: Mon/Tues/Thurs: 5 pm – 7 pm**

**Tim: Wed: 11 am – 1 pm; 3:30 pm – 5:30 pm**

## References

- Arco-Tirado, J. L., Fernández-Martín, F. D., & Fernández-Balboa, J. (2011). The impact of a peer-tutoring program on quality standards in higher education. *Higher Education, 62*(6), 773-788. doi:10.1007/s10734-011-9419-x
- Colver, M., & Fry, T. (2015). Evidence to Support Peer Tutoring Programs at the Undergraduate Level. *Journal of College Reading and Learning, 46*(1), 16-41. doi:10.1080/10790195.2015.1075446
- Chan, N. N., Phan, C. W., Aniyah Salihan, N. H., & Dipolog-Ubanan, G. F. (2016). Peer Assisted Learning In Higher Education: Roles, Perceptions and Efficacy. *Pertanika Journals: Social Science and Humanities, 24*(4) 1817-1828.
- Colvin, J. W. (2007). Peer tutoring and social dynamics in higher education. *Mentoring & Tutoring: Partnership in Learning, 15*(2), 165-181. doi:10.1080/13611260601086345
- Moust, J. H., & Schmidt, H. G. (1995). Facilitating small-group learning: A comparison of student and staff tutors behavior. *Instructional Science, 22*(4), 287-301. doi:10.1007/bf00891782
- Bunce, D. M., Komperda, R., Dillner, D. K., Lin, S., Schroeder, M. J., & Hartman, J. R. (2016). Choice of Study Resources in General Chemistry by Students Who Have Little Time To Study. *Journal of Chemical Education, 94*(1), 11-18. doi:10.1021/acs.jchemed.6b00285
- Ehrenberg, R. G., Brewer, D. J., Gamoran, A., & Douglas Wilms, J. (2001). Class Size And Student Achievement. *Psychological Science In The Public Interest, 2*(1), 1-30.
- Cooper, E. (2010). Tutoring Center Effectiveness: The Effect of Drop-In Tutoring. *Journal of College Reading and Learning, 40*(2), 21-34. doi:10.1080/10790195.2010.10850328
- Hernandez, P. R., Schultz, P. W., Estrada, M., Woodcock, A., & Chance, R. C. (2013). Sustaining Optimal Motivation: A Longitudinal Analysis of Interventions to Broaden Participation of Underrepresented Students in STEM. *Journal of Educational Psychology, 105*(1). doi:10.1037/a0029691
- Donohue, T. L., & Wong, E. H. (1997). Achievement Motivation and College Satisfaction in Traditional and Nontraditional Students. 237.
- Musah, R. A., & Ford, M. (2016). Peer-Based Supplemental Instruction in STEM: Differences in Effectiveness Across Transfer and Nontransfer Undergraduates. *Journal of Research on Educational Effectiveness, 10*(3), 596-618. doi:10.1080/19345747.2016.1213341

Kulatunga, U., Moog, R. S., & Lewis, J. E. (2013). Argumentation and participation patterns in general chemistry peer-led sessions. *Journal of Research in Science Teaching*, 50(10), 1207-1231. doi:10.1002/tea.21107