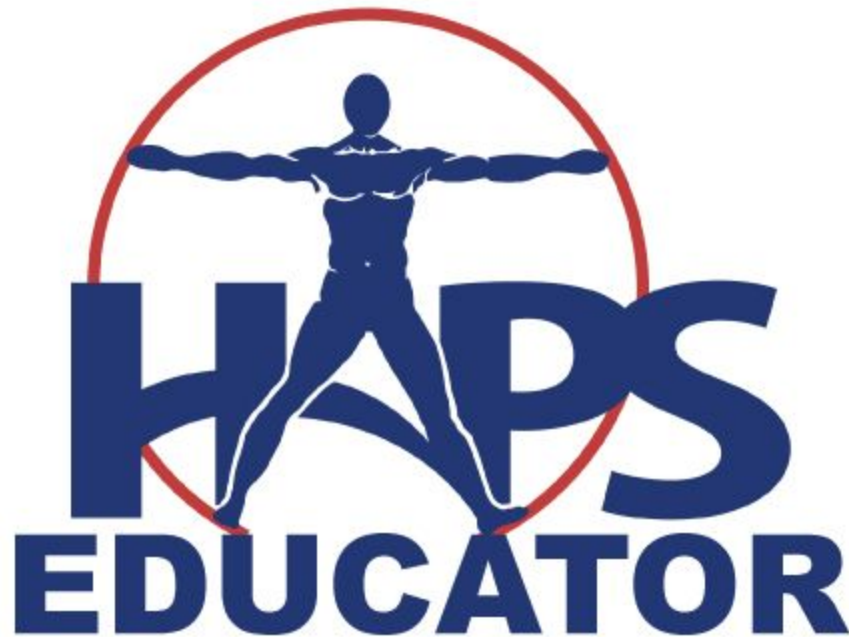


## **Encouraging Student Participation in Peer-Led Discussion Sessions**

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# Encouraging Student Participation in Peer-Led Discussion Sessions

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## Abstract

Supplemental instruction using peer leaders can assist student learning in undergraduate STEM courses, but optional sessions are not well attended. This study compared attendance in peer leader sessions, nonproductive grade rates, and student evaluation data across two Human Anatomy and Physiology I courses in two different years. One course included peer leader session times that were posted at the start of the semester along with course schedules and incentives for attendance. In the other course, peer leader session times were scheduled after the start of the course without additional incentives for attendance. Incentivizing students and pre-planning peer leader sessions was associated with 70.4% of students attending at least ten weeks of peer leader sessions and a modest decrease in nonproductive grades. By comparison, 9.6% of students attended peer leader sessions in the course that lacked pre-scheduled sessions and student incentives. Future planning should include assessments of student learning and critical thinking associated with the peer leader program. doi: 10.21692/haps.2018.006

**Key words:** peer leader, supplemental instruction, peer-assisted learning

## Introduction

Peer-supported learning, both structured and unstructured, can augment student learning in Human Anatomy and Physiology courses, but the optimal way to design such an environment remains unclear. Collaborative learning in universities gained momentum in the 1990s, highlighting the gains in student learning and comprehension (Bruffee 1999). Analysis of collaborative learning methods including supplemental instruction points to advantages including increased student engagement, ownership of individual learning, and better communication through interaction with peers. Caveats include effectively encouraging student participation and fostering equal contributions from individual students. Supplemental instruction includes using designated students, hereby referred to as peer leaders, to foster learning in the larger group.

Peer-assisted learning involves the use of students to facilitate learning comprehension and student success in a course. Peer leaders may be current or former (cross-year) students in the course, and the instructor chooses them before or at the beginning of the course (Topping 2005). Often, they attend course sessions and have access to notes and materials provided by the instructor. Peer-assisted learning has been linked to increased student performance and learning (Martin *et al.* 1994). Students report feeling comfortable approaching the peer leader and they are more willing to ask questions in sessions (Hensen and Shelley 2003). In cross-year peer leader settings, the enrolled students understand that the peer leader has successfully completed the course.

A growing number of STEM courses have implemented peer-assisted learning over the past two decades. The approach is well established in mathematics, chemistry, and physics courses at the undergraduate level (Hensen and Shelley 2003 and Evans *et al.* 2001). A growing number of medical schools use supplemental instruction and report gains in medical licensing exams. (Sobral 2002, Blanc and Martin 1994). Interestingly, supplemental instruction in human anatomy and physiology courses is not as widely reported compared to other STEM fields, though studies have indicated student success and learning gains in undergraduate biology courses (Rath *et al.* 2007 and Tenney and Houck 2003). Given the collaborative design in human anatomy and physiology laboratory courses, peer leader programs seem to be a natural fit.

The design of a peer leader program varies, and several considerations should be made prior to program implementation. Instructors may choose to provide more in-depth materials to cross-year peer leaders. The peer leader sessions may vary widely in their design and logistics. The instructor should be involved at some level in creating and approving the format of sessions. Sessions that are primarily question-and-answer in design often have the drawback of few students asking questions (or the same student asking all of the questions). The result can be a shortened session with students in attendance feeling frustrated that the experience did not add to their success in the class or knowledge of the content. Periodically, the instructor, peer leader, and students should evaluate the session format.

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Considerations for the peer leader program include:

- Are the sessions mandatory for enrolled students?
- Who determines the format of the sessions?
- Is there a structured component to the session?
- What is the goal of each session?
- What is the ratio of peer leaders to students?
- How are the sessions scheduled?
- What type of room is the session held in? Will the peer leader have access to media and technology in that room? Does the room easily accommodate students working in groups?
- Who is responsible for logistics and notifying students of a change in the sessions?
- If attendance is taken, what is the protocol? How are attendance sheets or files collected and stored?

Peer leaders harness time in or out of class to lead sessions for the enrolled students. Sessions held immediately after class are often better attended, as long as many of the students do not have another class at that time. Sessions should be offered multiple times during the week in order to accommodate varying schedules. A weekly meeting of the peer leader and the instructor is a helpful component. The purpose of the meetings is three-fold. One, these meetings promote collegiality between the instructor and peer leader, especially important if the two people do not know each other well. Two, the meetings allow for better understanding of the material through discussion. Three, the meetings provides a time for the peer leader to share feedback and problems noted in the sessions. The peer leader should be compensated (monetarily or with academic credit) for sessions, meeting times, class attendance, and preparation time.

I first implemented peer leaders in Human Anatomy and Physiology courses through a STEM mini grant offered by my institution. Columbus State University, located in Columbus, GA, is a public, regional university with an approximate enrollment of 8200 students. The Human Anatomy and Physiology two-course sequence is required for three separate degrees and is offered every semester including a summer semester. Each year, we offer ten to eleven sections (24 students per lab section) of Human Anatomy and Physiology I and seven to eight sections of Human Anatomy and Physiology II. These courses are taught as combined lecture sessions (72-168 students) and divided into smaller sections for labs (24 students/lab). On average, half of the Human Anatomy and Physiology I students earn non-productive grades (D/F/WF). A student must earn a C or better in Human Anatomy and Physiology I to enroll in Human Anatomy and Physiology II.

I began measuring the success of the program by looking at peer leader session attendance rates and final grade performance. Students with modest or above average attendance at these sessions had a higher final course average than students who attended sporadically or did not at all (Hughes 2011). Were the students who attended frequently more likely to succeed, regardless of session attendance? Did attending the sessions have a positive effect on student learning? What supplemental instruction has measured benefits? Other studies report that the higher performing students are more likely to attend sessions, thus skewing course average data (Jensen and Moore 2009).

One step towards answering these questions is to examine the motivation for participating in the sessions. The persistent problem with the peer leader program was low attendance. The sessions were optional for the enrolled students. I began the course by casually polling the students as to which meeting times would be best. I then gravitated to online polling sites to find the best times. I also encouraged students to approach the peer leader to find an alternate time if they were unable to attend meetings. Even though multiple sessions were offered weekly, attendance remained at or below ten percent. Given the success of students who attended the sessions, coupled with the pressure to justify the cost of the program, why did more students not attend?

The final course evaluation at the end of each semester included a prompt that asked students to comment on why they did not attend more sessions. The number one response was that the times did not fit into their schedules. This reason persisted even when the instructor and peer leaders encouraged students to contact them with available times for alternate sessions. Thus, the peer leader program modifications focused on encouraging student participation in the sessions. Would offering an incentive to attend the peer leader sessions and including session information prior to course registration increase the peer leader session attendance? This study was designed to evaluate the effects of incentivizing and pre-posting session times on the attendance rates, nonproductive grade percentages, and student evaluations of the peer leader program in Human Anatomy and Physiology I.

## Methods

### *Participants and Planning*

Participants included students enrolled in Human Anatomy and Physiology I at Columbus State University referred henceforth as Year I (120 students) and Year 2 (95 students) and the peer leaders (two per semester) for these two courses. Anatomy and Physiology I is a degree requirement for students majoring in Exercise Science, Health Science, and Nursing. Students across campus who are applying to graduate-level professional programs including dental, medical, and pharmacy schools also take the course. Course concepts

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included chemistry, cell structure, genetics, histology, and human organ systems including integumentary, skeletal, muscular, neural, and special senses. The prerequisite for Human Anatomy and Physiology I is an introductory chemistry course with a C or better.

I was the instructor for both Year 1 and Year 2 courses, and I hired the peer leaders prior at the start of the semester. Peer leaders were selected based on their success in the Human Anatomy and Physiology courses as well as their willingness to foster student learning through planned sessions. The Institutional Review Board of Columbus State University approved this project (IRB #13-029, Year 1; IRB #12-030, Year 2). Informed consent was obtained from all participants and student identities were protected in the analyses.

Three to four peer leader sessions were offered every week during the Year 1 and Year 2 courses. Weekly session times during Year 1 were based on student responses to an online poll during the first week of class. During Year 2, the session times were pre-arranged and disseminated to the students prior to the start of the semester. Course schedules are posted online during the previous semester; so advanced planning was necessary to inform students of the session times in Year 2. The following language was used online directly underneath the Year 2 class meeting schedule:

*Students will be expected to attend one of the weekly discussion sessions: (days/times listed)*

By pre-posting the session schedule in Year 2, students were able to plan around other course and work schedules prior to the start of the semester. I reminded the students of the session times throughout the semester, and I asked any students who could not make any weekly sessions to contact me the first week to potentially add an additional weekly session based on demand. If a scheduled weekly session did not have attendees, the session time was adjusted to serve the maximum number of students.

Earned credit through session attendance differed across Years 1 and 2. Students who attended one weekly session earned one-half point extra credit towards course points during Year 2. Students who attended more than one weekly session did not earn additional credit. Attending a session each week resulted in seven extra credit points towards 730 total course points in Year 2. I awarded no additional credit to students who attended peer leader sessions in Year 1. The peer leaders were responsible for taking attendance at all sessions using rosters I provided them.

#### Discussion session format

Each discussion session led by the peer leader was limited to one hour and held in an available classroom with a computer station and projector system. I planned the format of each weekly session and created the handouts and activity sheets. I met with the peer leader each week to get feedback, answer questions, and go over the next activity. The discussion sessions during Years 1 and 2 included structured activities with included time for questions at the end of each session. The structured activities across Years 1 and 2 remained the same with only minor editing of worksheets and resources.

#### Data collection and analysis

Course grades, peer leader session attendance, and supplemental student evaluations were collected, compiled and analyzed at the end of each term. The supplemental evaluation included questions specifically directed at the peer leader program that were scored on a Likert scale. Averages and standard deviations of these data were calculated and reported. A t-test was performed on the student responses to determine statistical significance using the 95% confidence interval.

## Results

### Attendance

Figure 1 shows Human Anatomy and Physiology I semester attendance data from Year 1 and 2 courses. Prescheduled sessions and extra credit from session attendance were only in Year 2. The average number (+/- SD) of peer leader sessions attended during the course was significantly higher in Year 2 compared to Year 1 (11.0+/-0.5 vs. 3.5+/-0.5,  $p < 0.0001$ ). Figure 2 compares Year 1 to Year 2 based on session attendance categories. In Year 1, 73.1% of enrolled students attended

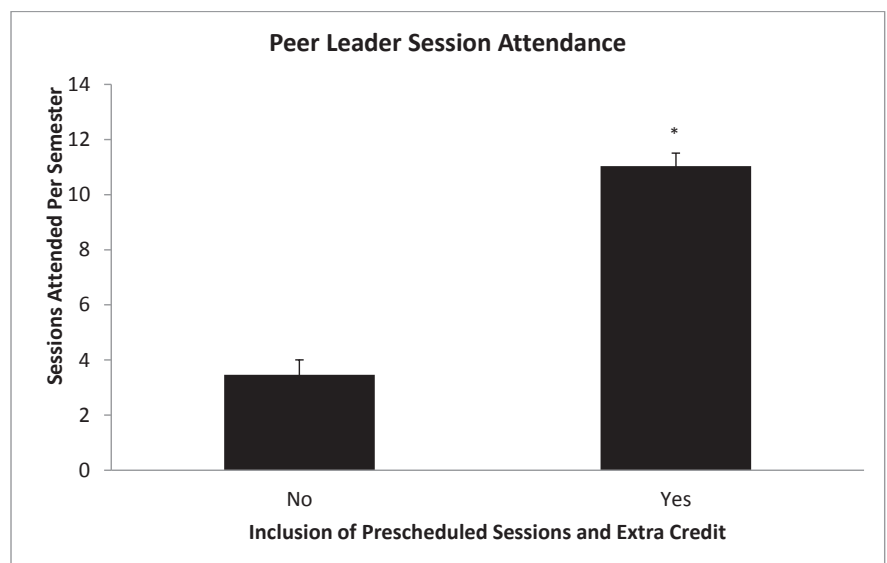


Figure 1. Peer leader session attendance with (Year 2) and without (Year 1) prescheduled sessions and extra credit for session attendance. Data are reported as average number of sessions attended (+/- SD) during the course. Attendance data were collected throughout each semester by the respective peer leaders. \*  $p < 0.0001$ .

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fewer than five sessions during the course. In contrast, only 11.4% of students in Year 2 attended fewer than five sessions. Students attending at least ten sessions during the course increased from 9.6% in Year 1 to 70.4% in Year 2.

*Nonproductive Grades*

Figure 3 shows the percentage of nonproductive grades in Human Anatomy and Physiology I in both years. Nonproductive grades are D, F, and WF. A grade of C or better is required for admittance into the university's Human Anatomy and Physiology II course. The percentage of students earning a nonproductive grade at the end of the course was 47% and 40.6% in Year 1 and Year 2, respectively.

*Peer Leader Student Evaluation*

Table 1 outlines the end-of-course survey results of the peer leader program by the enrolled students. The evaluations were anonymous, and the students earned credit by initialing the roster after submitting the evaluation. The same evaluation questions were used Year 1 and Year 2. All questions were scored on a one to five Likert Scale. The average scores of the responses ranged from 3.8-4.7 across the two years. None of the average scores for the questions decreased in Year 2 compared to Year 1. The average response score significantly increased from Year 1 to Year 2 in response to the following questions:

*The peer leader is knowledgeable of the course material.*

*The peer leader does a good job of answering questions.*

*The peer leader helps me understand the course material.*

*I feel comfortable asking the peer leader for help.*

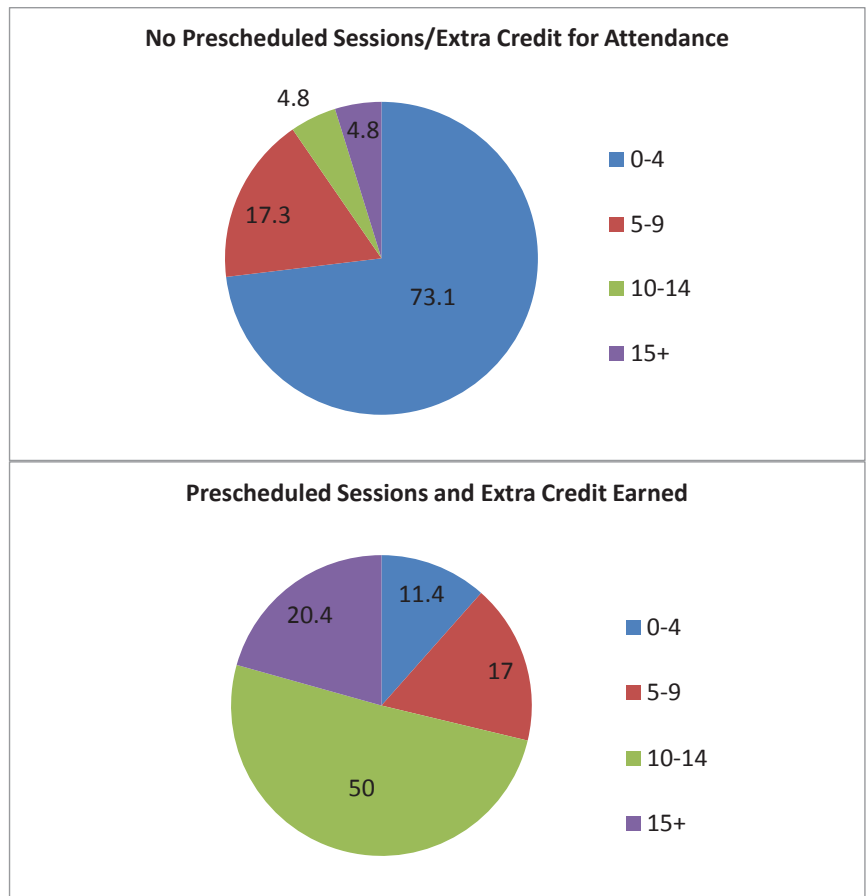


Figure 2. Distribution of peer leader session attendance throughout the course. The percentage of students attending 0-4 (blue), 5-9 (red), 10-14 (green), and 15+ (purple) sessions are included for Year 1 (top) and Year 2 (bottom).

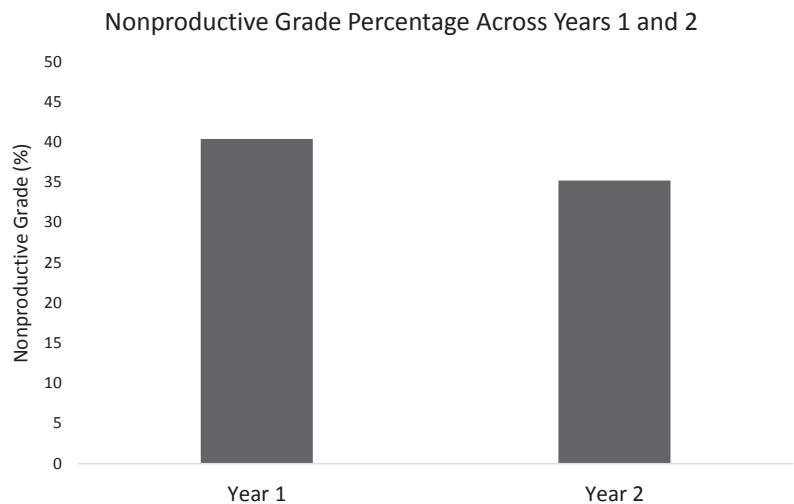


Figure 3. The percentage of students in Human Anatomy and Physiology courses earning a nonproductive grade (D, F, WF) at the end of the course. Year 2 included pre-posting peer leader session times and awarding extra credit for session attendance.

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## Discussion

Peer leader session attendance significantly increased in Year 2, while the nonproductive final grade percentage decreased modestly. Low attendance in peer leader sessions had been a consistent problem in former years. Several attempts to increase attendance, including online polls to schedule session times, in-class reminders, and structured activities were not effective in increasing student attendance. Results from this study indicate that including session times in the schedule and awarding extra credit were positive actions to correct the attendance problem. Given that both changes were made in the same year, the relative impact of each is unknown.

In addition, other variables may have contributed to the attendance shift. Pre-scheduling the sessions and posting the times on the university's course schedule link allowed the students to plan the schedule for that semester based on the session offerings. A few students emailed me prior to the start of the semester; concerned they could not find a session time that fit with their schedules. I explained that an additional weekly session would be added at the start of the semester based on student feedback. The extra credit earned by attending a weekly session was likely highly sought out by many students. For example, students asked me throughout the semester when and how the session attendance extra credit would be added to their average. Thus, I surmise that the combination of these two changes led to the significant increase in session attendance in Year 2 vs. Year 1.

Positive student responses to several prompts in the end-of-course supplemental evaluation significantly increased in Year 2 compared to Year 1. The prompts included statements about the peer leader's knowledge of the material and assistance in helping students understand the material. The reason for this change is unknown, though possible contributing factors may include the effectiveness of the individual peer leader. A peer leader in one course may develop a stronger connection to the enrolled students compared to the pairing in another semester. Interestingly, this connection may drive an uptick in session attendance. Alternately, the increase in session attendance may positively influence the peer leader evaluation. Evaluating student responses and attendance over subsequent years would help discern the relative influence of the individual peer leader.

Question	Year 1		Year 2		p value
	AVG	SD	AVG	SD	
The peer leader is knowledgeable of the course material.	4.3	0.7	4.6	0.6	0.003*
The peer leader does a good job of answering questions.	4.3	0.8	4.6	0.6	0.05*
The peer leader helps me understand the course material.	4.2	0.8	4.5	0.7	0.04*
The peer leader provides tools to help me learn the course material.	4.2	0.8	4.4	0.8	0.26
I feel comfortable asking the peer leader for help.	4.3	0.8	4.6	0.6	0.05*
I am more confident about the exam(s) after attending a peer leader session.	3.8	1.0	3.9	1.0	0.90
I am more prepared for the exam(s) after attending a peer leader session.	4.0	1.0	3.9	1.0	0.68
I have developed a better understanding of the subject with the help of the peer leader.	4.0	0.8	4.1	1.0	0.71
Based on my experience, I would encourage other students to engage in peer leader activities.	4.3	0.8	4.4	0.9	0.50
I recommend the BIOL 2221 cross-year peer-assisted learning program continue in future semesters.	4.5	0.8	4.7	0.6	0.23
I welcome the implementation of peer leaders in other courses.	4.5	0.7	4.7	0.7	0.27

Table 1. Peer leader program evaluation results. Enrolled students submitted anonymous evaluations at the end of the course that prompted students to mark each question using the five-point Likert scale, where 0=no opinion, 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree. Averages +/- SD were calculated for each question each year, and Student's t test was computed for each question. \* indicates Year 1 and Year 2 results were significantly different ( $p < 0.05$ ).

In peer leader meetings with structured sessions, the students worked on activities designed by the instructor to supplement learning in areas in which students traditionally struggle. This form of supplemental instruction is associated with increased student learning and retention (Dawson *et al.* 2014). Areas of particular focus in Human Anatomy and Physiology I included molecular bonding, molarity, genetics, histology, and ossification. The sessions provided more structured time to think about the course material and ask questions, helping to resolve misconceptions. One caveat to incentivizing session attendance is an increase in the number of unengaged students in the sessions, potentially distracting other students. This situation underlies the importance of communication between the instructor and peer leader including discussing strategies to encourage active student engagement.

It is important to assess the degree to which peer leader sessions impact student understanding. Which activities and approaches are most helpful? What critical thinking assessment can be employed at the beginning and end of a session to gauge effectiveness? What improvements do the peer leaders suggest? What is the optimal way to recruit and train effective peer leaders?

Careful design and consideration should continue to be assessed and optimized, leaning on best practices in teaching and learning (Topping 2005). Supplemental instruction in STEM courses continues to advance in both undergraduate and professional programs (Dawson *et al.* 2014). While peer-reviewed studies on the impact of supplemental instruction

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in mathematics, chemistry, and physics undergraduate course are numerous, supplemental instruction in Human Anatomy and Physiology course design is a congruent opportunity. If sessions are optional, posting the meeting times along with the course schedule and including incentives can effectively incentivize participation. Moving forward, Human Anatomy and Physiology instructors should continue to share problems and best practices in order to optimize peer leader programs.

### About the Author

Dr. Kathleen (Katey) Hughes, Professor of Biology, has been a member of the Columbus State University (CSU) faculty since 2005. She earned a BS in Biology degree in 2000 from Winthrop University and a PhD in Biomedical Science (Department of Physiology and Functional Genomics) in 2004 from the University of Florida. She is the founder and director of CSU's Competitive Premedical Studies Program in CSU's College of Letters and Sciences. Dr. Hughes teaches a variety of courses at the undergraduate and graduate levels including Human Anatomy and Physiology, Neuroscience, Comparative Vertebrate Anatomy, Cell Biology, and General Biology.

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