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BRIEF

Assessing Students' Satisfaction with a Redesigned Pharmacology Course Series

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Objective. To describe the revision of a pharmacology course series taught over three quarters within a Doctor of Pharmacy (PharmD) curriculum and assess changes in students' attitudes toward and performance after the revision.

Methods. Based in part on students' dissatisfaction regarding a pharmacology course series, a course director was hired and tasked with teaching a major portion of the course content, rewriting course examinations, and facilitating active learning in the course series. Course evaluations and examination scores of students who completed the course series after the implementation of the redesigned curriculum (classes of 2015 and 2016) were assessed and compared with those of students who completed the course before the revisions were made (classes of 2013 and 2014).

Results. Qualitative analysis of second-year pharmacy student evaluations identified a lack of integration and coordination within the pharmacology course sequence. Poor examination quality and the absence of active teaching methods were other frequently described shortcomings of the pharmacology curriculum. Course evaluations dramatically improved after shortcomings were addressed and students' performance in the subsequent therapeutics course also increased significantly.

Conclusion. Adding additional structure to and oversight for a pharmacology course series by adding a course director improved student satisfaction with the course and improved performance in the subsequent therapeutics course. This study highlights the importance of a well-designed pharmacology curriculum for continued success in core courses in the PharmD curriculum.

Keywords: pharmacology, therapeutics, doctor of pharmacy degree, curriculum, course redesign

INTRODUCTION

According to the Accreditation Council for Pharmacy Education (ACPE) Standards, Doctor of Pharmacy (PharmD) degree program curricula should provide students with knowledge from foundational sciences in a format that allows them to solve therapeutic problems.¹ Pharmacology bridges basic and clinical sciences by laying the foundational concepts required for the understanding of patient-specific drug therapies.² Although studies have shown that knowledge of pharmacology is essential for therapeutic rationale and decision making, there are no recommendations regarding a pharmacology course design that will optimally prepare students for clinical problem solving involving the therapeutic use of drugs.

Many schools, including pharmacy, medical, and dental schools, have modified their pharmacology curriculum in the past decade with resultant increases in student satisfaction.³⁻¹² One strategy in these curricular modifications is to emphasize the importance of pharmacology as an integrative science.^{5-8,11} Schools have shifted away from teaching pharmacology, physiology, and therapeutics in silos and toward teaching interdisciplinary curricula that emphasizes the interrelatedness of basic and clinical principles. One study reported high student satisfaction when an interdisciplinary approach was used to teach pharmacology topics in combination with physiology topics in the neurosciences.¹¹ In another study, medicinal chemistry, pharmacology, and pharmacotherapeutics, which are traditionally taught as separate courses, were integrated into one course sequence. Students were highly satisfied with the integration process and stated that it enhanced their learning experience.⁸ Integrating medicinal chemistry and pharmacology into one entity also significantly increased ratings on student course evaluations after the redesign.⁵

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Finally, another study used a case-oriented, multidisciplinary format to teach pharmacology to second-year medical students, which resulted in improved student satisfaction as well as improved class attendance.⁶ Aside from promoting pharmacology as an integrative subject, other studies have reported on implementing active-teaching modalities such as team-based learning,⁹ problem-based learning,⁴ case-study exercises,¹² board games,¹³ and technology-based teaching into pharmacology courses. The addition of team-based learning, problem-based learning, and case-study exercises to pharmacology courses all resulted in more positive student perceptions about the course, while technology-based teaching led to increased student engagement¹⁰ and introduction of a board game led to significantly improved pharmacology examination scores.¹³

Based on student feedback, the Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS) modified its pharmacology curriculum by improving integration and coordination within the pharmacology course, between each section of the pharmacology course series, and with the concurrent physiology courses. Furthermore, active-teaching modalities were introduced and questions on course examinations were improved. The goal of these modifications was to increase students' mastery of the integrated pharmacology material, thereby better preparing them for the therapeutics course. This paper describes the changes made and determines whether these changes increased student satisfaction with the pharmacology course and translated into improved student performance in therapeutics.

METHODS

Demographic data for students graduating from SSPPS from 2013 through 2016 were obtained from administrative records. Students' age, gender, race/ethnicity, major, and grade point average (GPA) were compared between the different years. Undergraduate majors were categorized into natural science, social science, and undeclared/other. Race or ethnicity was categorized as African American, Asian, Hispanic, Native American, white, and undeclared.

The pharmacology course was a required core course for second-year pharmacy students. This course was first implemented for the class of 2013 as a result of a major curriculum change in the school of medicine that removed the shared pharmacology curriculum for medical and pharmacy students. As a consequence, the school of pharmacy had to implement its own pharmacology curriculum. The pharmacology course operated for two years before the redesign. This three-quarter course was predominantly lecture-based, with a total of 98 lecture hours. Two examinations were administered each quarter,

resulting in a total of six examinations during the course. Because of the relatively short timeframe in which this course was created, multiple instructors were recruited to teach. An average of 14 guest lecturers taught per quarter for an average of 1.8 hours per lecturer.

With the redesign, the broad concepts taught in the course did not change, but the organization and methods of teaching were modified. In recognition of the need for greater continuity within the course, a new faculty position for a course director was created which focused entirely on pharmacology education in the PharmD curriculum. A licensed pharmacist with a PhD in the basic sciences was hired. This pharmacology educator provided uniformity both as the course director and as a course lecturer for multiple class sessions each quarter. This ensured that a consistent lecture format was used to provide extensive links between new and previously learned material and to more closely align course topics with those taught in the concurrent physiology course series. The number of guest lectures in the pharmacology course was continuously reduced in the years following the redesign, ie, there was an average of 12 guest lecturers per quarter for the class of 2015 and an average of eight guest lecturers per quarter for the class of 2016. Guest lecturers taught an average of 2.1 hours per lecturer.

Examinations were completely rewritten to improve their validity. Several factors that could potentially interfere with the meaningful interpretation of test scores were identified such as an absence of clear learning objectives to link to multiple-choice questions (MCQs), a lack of an examination blueprint, and the use of flawed MCQs. To address these validity threats,¹⁴ clear learning objectives were written and used to create an examination blueprint to guide the construction of a well-balanced examination. Multiple-choice questions containing flaws such as an "unfocused stem" and "window dressing" were rewritten so that they adhered to the best practices of MCQ writing.¹⁵ Test statistics were analyzed carefully to make sure that item difficulty was appropriate and to identify and remove nonfunctional options.¹⁶ Test score reliability was calculated using the Kuder-Richardson Formula 20.¹⁷

Active teaching modalities were introduced with the implementation of large-group problem-solving sessions. In the first year following the curricular redesign, the large-group sessions consisted primarily of examination-style multiple-choice practice questions. In subsequent years, the questions were converted away from multiple-choice to more extensive application problems. The revised application problems were designed with three goals in mind: first, to help students review the material already learned in class; second, to apply

concepts taught in the lecture; and third, to allow students to develop specific methods to approach complex pharmacologic problems and provide practice in using those methods. For each problem, students actively worked together in teams, assimilating knowledge, solving problems, and teaching one another for a set time. After the student teams registered their answers, the course director reviewed the problem to ensure all students understood both the information and the problem-solving methods used. The content as well as the number of total course hours and the number of examinations did not change significantly during the redesign.

To analyze the qualitative data gathered from responses to the open-ended question “what would you suggest to improve the content or presentation of the course material?” the primary investigator conducted an analysis of all comments in multiple passes. Data analysis was grounded in a theory-based approach.¹⁸ The primary investigator developed a coding scheme during the repetitive reading of all comments. Resulting themes were explored and defined during data analysis. As themes emerged, they were abstracted to form categories.¹⁹

Second-year pharmacy students were surveyed over four years (classes of 2013-2016) (two years prior to the revisions and two years after). Students were asked to rate their perceptions of course organization, communication, and examinations, and the overall applicability of the material among other aspects of the course using a 5-point Likert scale (strongly disagree=1 to strongly agree=5). Survey administration occurred after each quarter. Five hundred eighty deidentified responses from second-year pharmacy students were collected and analyzed. For therapeutics course evaluations, third-year pharmacy students were surveyed over four years, and 618 deidentified responses were collected and analyzed.

Therapeutics examination scores for the four classes of pharmacy students were obtained from administrative records. The 180-credit hour therapeutics course for third-year pharmacy students was administered over three quarters. The average therapeutics score was calculated from all three final examinations for each student (n=211). The therapeutic examinations consisted of two patient cases integrating disease states taught during the quarter followed by short-answer essay questions in the following categories: signs and symptoms, risk factors and etiologies, therapeutic rationale for drug selection, drug dosing, therapeutic and toxic monitoring parameters, and patient education. The final therapeutics examination was cumulative and remained unchanged in level of difficulty and format over the study period. In contrast to the objective therapeutics questions on the final examination, the therapeutics final grade included more sub-

jective elements, eg, participation points for attendance in small group settings and an oral examination that included a behavioral evaluation.

Statistical analysis was conducted using R statistical software (R version 3.5.1, 2018 the R Foundation for Statistical Computing),²⁰ and GraphPad PRISM, version 5 (San Diego, CA). Chi-square tests were used to compare students by gender, race/ethnicity, and major of second-year pharmacy students (classes of 2013-2016). Age at admission and GPA were compared using one-way ANOVA with Bonferroni post-test. Course characteristics, course evaluations and therapeutics course performance before and after the course redesign were compared using an unpaired, two-tailed *t* test. The UC San Diego Human Research Protection Program granted Institutional Review Board approval.

RESULTS

All students who graduated from 2013 through 2016 were included in this study (n=211). Demographics of the four student cohorts are summarized in Appendix 1. Students were an average of 23 years old, 61% were Asian, and had a mean admission GPA of 3.69 (SD=0.15). Ninety-seven percent of the students had earned an undergraduate degree in the natural sciences before beginning the Doctor of Pharmacy (PharmD) program. No significant differences were found in age, gender, race/ethnicity, undergraduate major, or GPA between the different student cohorts.

To critically evaluate the pharmacology course, students' suggestions for course improvements were analyzed. Course evaluations (n=155) collected from the pharmacology course series before the redesign yielded 121 comments. The major themes that emerged from the comments included the need to improve integration (eg, better coordination of the lectures within the course and better coordination of the course with other courses in the curriculum); the need to improve examination quality; and the need to add application-based teaching and learning modalities. Additionally, students requested that goals and objectives be provided for every lecture, the pharmacology content be more consistent, and delivery of lectures be improved and lecture format be consistent (Table 1).

To address the three major shortcomings identified by students, several changes were made to the pharmacology course series. As indicated in Table 2, the percentage of course lectures taught by course directors increased from 15% to 43%. This increase reflects lectures taught by the new course director overseeing the year-long course, which allowed greater integration and coordination within and between this course and other portions of the

Table 1. Pharmacy Students' Responses When Asked, "What Would You Suggest to Improve the Content or Presentation of the Course Material?" (Prior to Redesign)

Suggested Changes	Examples	Total Student Comments (%) (n=121)
Integration/coordination		
Appropriate coordination between lectures within the course	"The lecturers need to be more aware of our background"	39 (32)
Appropriate coordination between this course and other proportions of the curriculum	"Would be helpful if material correlated timewise better with other courses running at the same time."	
Examinations		
Examination questions need to be consistent with the learning objectives	"Make sure the exams also follow the learning objectives"	28 (23)
Improve exam question quality	"Have one person write all of the exam questions and make sure they are relevant and well-worded"	
Additional teaching and learning modalities		
Introduction of teaching modalities that facilitate the application of course material	"As required in the course expectation, the materials should be accompanied with case studies"	16 (13)
Introduction of learning modalities that facilitate the retention of course material	"Make it more clinically applicable"	
Communication		
Implementation of consistent goals and objectives	"While some lecturers included learning objectives, the course could be improved by standardizing the types of learning objectives and including them in every lecture. Learning objectives give structure to a study regiment and facilitate active learning, rather than passive note-taking and reading" "Consistent learning objective needed"	15 (12)
Content		
Consistency in pharmacology content Less emphasis on physiology	"Less physiology, more drug focus, but at the same time, provide a more reasonable amount of details for the drugs"	15 (12)
Delivery of lectures and lecture format		
Better lecturers with excellent presentation and communication skills Consistent formatting of lecture slides	"The lecturers should be chosen based on how well they can communicate the information to students. People who are experts on certain topics do not always convey the information well. It's really hard for students to learn in that environment." "More similarly formatted lectures (have some sort of standard format for every lecture)"	8 (7)

curriculum. In accordance, the percentage of lectures taught by guest lecturers decreased. Although the percent of courses taught by faculty members from the school of pharmacy remained constant, there was a significant decrease in the percent of faculty members from outside the school of pharmacy teaching in the course (Table 2). Removing examination flaws and writing questions that were more discriminating improved the examination validity. Furthermore, the reliability coefficient as one indicator of test quality increased from .62 to .74 after the curricular change. The last entry in Table 2 documents

the introduction of large-group problem-solving sessions to a total of 12% of the instructional hours. These sessions provided an application-based teaching modality requested by the students previously absent from the course. The problem session provided students with experience in application of fundamental principles in complex pharmacological responses or clinical settings, which is an ongoing challenge.

To determine the impact of the redesigned course on students' satisfaction, course evaluations were analyzed before and after the redesign. Whereas the data collected

Table 2. Comparison of the Pharmacology Course Structure Before and After Redesign^a

	Before Course Redesign (Classes of 2013 and 2014) Mean (SD)	After Course Redesign (Classes of 2015 and 2016) Mean (SD)
Improving integration/coordination		
Percentage of teaching by Course Director (% of total instructional hours)	15 (12)	43 (18) ^b
Percentage of teaching by School of Pharmacy faculty (% of total instructional hours)	22 (8)	22 (11)
Percentage of teaching by other faculty outside School of Pharmacy (% of total instructional hours)	63 (18)	35 (21) ^b
Improving exam quality		
Reliability Coefficient	0.62 (0.11)	0.74 (0.06) ^b
Implementation of application-based teaching modalities		
Percentage of large group problem solving sessions per quarter (% of total instructional hours)	0	12 (6) ^b

^a Comparison of the percentage of instructional hours taught by the course director, the exam's reliability coefficient and the percentage of problem-solving sessions in each quarter of the pharmacology course before (n=6) and after the course design (n=6). Unpaired, two-tailed *t*-test, ^b *p*<.05

from the classes of 2013 and 2014 reflected students' satisfaction before the redesign, data collected from the classes of 2015 and 2016 reflected students' satisfaction after the redesign. A total of 580 evaluations were collected from each quarter of the pharmacology course over four years, with an overall response rate of 84% (89% for the class of 2013, 87% for the class of 2014, 71% for the class of 2015 and 89% for the class of 2016). Items on the survey instrument focused on course organization, communication, examinations, and the overall applicability of the material among other aspects of the course. Course evaluations improved significantly after the redesign of the pharmacology course. The most dramatic increase was found for statements related to the organization of the course, the clear communication of course objectives and other requirements to successfully succeed in this course, fair examinations, and the complete syllabus material (Table 3).

To explore whether the transformed pharmacology curriculum had an impact on students' learning and application, therapeutics course performance was analyzed. The therapeutics final examination performance significantly increased from an average of 81.9% (SD=5.2) before the redesign (n=106) to an average of 83.6% (SD=4.9) after the pharmacology course redesign (n=105; unpaired, two-tailed *t* test, *p*<.05). To ensure that the analyzed student cohorts were similar in their academic ability, students' demographics and overall undergraduate GPA (Appendix 1) were analyzed and did not reveal significant differences. The therapeutics course remained stable over the four-year study period, and no major changes in format, organization, and delivery of the material were identified. Course evaluations from 618 students were analyzed with an overall response rate of 90% (89% for the class of 2013, 91% for the class of 2014,

90% for the class of 2015, and 92% for the class of 2016). Evaluation scores did not significantly change over the study period (unpaired, two-tailed *t* test, Table 4).

DISCUSSION

Redesigning a pharmacology course series within a PharmD curriculum significantly improved student satisfaction with the course and student performance in the subsequently taught therapeutics course. The redesign addressed three key shortcomings: lack of integration and coordination, poor examination quality, and lack of active teaching modalities. Although there is no single definition of "integration," the individual educator is key to integrating content within and between courses.²¹ At a minimum, integration requires the different faculty members teaching within a course to communicate with each other and to be aware of the material covered by their colleagues.²² Many curricula are commonly flooded with various subject matter experts who are "parachuted" into courses for one or two guest lectures, never to be seen again by the students. This approach is rooted in the idea that each topic is best taught by a specialist in the field. Four decades ago, Irby and colleagues described this as the "parade of stars" model²³ and this is still commonplace in health professions education. In fact, students have indicated that the fewer teachers involved in a course, the more evident the integration of course content is.⁵ Integration is further improved by providing conceptual links between new and previously learned material, and through an optimal sequencing of topics within the course.²¹

In the curricular modification at SSPPS, these issues were addressed by introducing a designated course director for the course series. The director was experienced in

Table 3. Students' Perceptions of the Pharmacology Course Before (Class of 2013-2014) and After the Redesign (Class of 2015-2016)^a

Statements	Pharmacology Evaluation Scores (Class of 2013-2014)	Pharmacology Evaluation Scores (Class of 2015-2016)
	Mean (SD)	Mean (SD)
The course material was intellectually stimulating.	3.8 (0.1)	4.4 (0.2) ^b
The course policies and requirements (grading, assignments, attendance, etc.) were clear.	3.5 (0.4)	4.6 (0.2) ^b
The course was well planned and organized.	3.2 (0.4)	4.4 (0.3) ^b
The course objectives were clearly stated.	3.4 (0.4)	4.5 (0.2) ^b
Laboratory and/or workshop sessions were well planned and contributed to meeting the course objectives.	3.7 (0.2)	4.4 (0.2) ^b
Homework assignments were reasonable in number and contributed to an understanding of the course material.	3.8 (0.1)	4.4 (0.2) ^b
The required reading was useful in understanding the course material.	3.6 (0.1)	4.2 (0.4) ^b
Examinations were fair and representative of the course material presented.	3.5 (0.3)	4.4 (0.3) ^b
The syllabus materials were complete and enhanced the learning process.	3.4 (0.2)	4.4 (0.2) ^b
Correlations were provided that demonstrated the applicability of the material presented.	3.7 (0.2)	4.5 (0.2) ^b

^a Mean evaluation scores from every quarter from a total of 580 students (response rate 84%) were analyzed before (n=6) and after the course design (n=6). Responses based on a Likert scale of 1 to 5 where 1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree, 5=strongly agree

^b $p < .05$, unpaired, two-tailed *t*-test

the content of the pharmacology course and concurrent courses, and taught a considerable portion of pharmacology lectures. This allowed the director to identify and emphasize connections between pharmacology lectures throughout the year, as well as integrate course material with material taught in concurrent courses.

In the redesigned pharmacology course, the course director implemented large-group problem-solving sessions to help bridge the difficult transition from basic pharmacology principles taught in lecture and application in clinical scenarios. Although it is widely established that the implementation of active-teaching modalities increases students' satisfaction, most foundational courses such as pharmacology remain lecture-based.^{7,24,25} The development of such active-teaching sessions is a time-consuming task not easily achieved by faculty members who have many other important clinical and/or research responsibilities and clinical activities generally take priority over faculty member teaching obligations.²⁶ Investing significant resources to hire a professional pharmacology educator allows a school to bypass this challenge and further justify the investment. Additionally, the success of the redesign can be attributed to the training the pharmacology educator had. In other words, a course director who is a licensed pharmacist with PhD-level training in health sciences has the ability to effectively

translate the basic foundational sciences to the clinical care of patients. Through large-group problem-solving sessions, the course director modeled the application of pharmacology to therapeutics and provided the practice needed for students to succeed in small group sessions encountered in the therapeutics course series.

Students also identified poor examination quality as one of the three top shortcomings of the course. Their concerns included both poor quality questions and poor correlation between the course content and the array of questions on the examination. Examination questions with unfocused stems and heterogeneous answers are considered flawed,¹⁵ and such flawed examination questions may decrease the reliability of examination scores.¹⁴ Also, the frustration associated with answering flawed questions and questions poorly correlated with presented material decreases student satisfaction. The new course director rewrote all course assessments to eliminate flawed questions and to link questions with the revised learning objectives. The learning objectives were also revised at the time of the course redesign, allowing a better linkage of examination questions to specific learning objectives. The relative difficulty and number of questions for each examination remained unchanged. Reliability measures were analyzed to determine the reproducibility of the examination scores. Notably, the reliability

Table 4. Students' Perceptions of a Therapeutics Course Before (Class of 2013-2014) and After (Class of 2015-2016) Pharmacology Course Redesign^a

Statements	Therapeutics Evaluation Scores (Class of 2013-2014)	Therapeutics Evaluation Scores (Class of 2015-2016)
	Mean (SD)	Mean (SD)
The course material was intellectually stimulating.	4.5 (0.1)	4.6 (0.1)
The course policies and requirements (grading, assignments, attendance, etc.) were clear.	4.5 (0.1)	4.6 (0.1)
The course was well planned and organized.	4.4 (0.2)	4.4 (0.1)
The course objectives were clearly stated.	4.4 (0.2)	4.5 (0.1)
Laboratory and/or workshop sessions were well planned and contributed to meeting the course objectives.	4.4 (0.2)	4.5 (0.1)
Homework assignments were reasonable in number and contributed to an understanding of the course material.	4.4 (0.2)	4.5 (0.1)
The required reading was useful in understanding the course material.	4.2 (0.2)	4.4 (0.2)
Examinations were fair and representative of the course material presented.	4.3 (0.2)	4.4 (0.1)
The syllabus materials were complete and enhanced the learning process.	4.3 (0.2)	4.4 (0.2)
Correlations were provided that demonstrated the applicability of the material presented.	4.4 (0.1)	4.5 (0.1)

^a Mean evaluation scores from every quarter from a total of 618 students (response rate 90%) were analyzed before (n=6) and after the course design (n=6). Responses based on a Likert scale of 1 to 5 where 1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree, 5=strongly agree. Comparisons between different evaluation scores of the Class of 2013-2014 and the Class of 2015-2016 were conducted using an unpaired, two-tailed *t*-test. No significant differences between any of the statements were detected

coefficient of examinations improved, and student satisfaction with the examinations improved as well.

There are several limitations to this study. First and foremost, student performance in the subsequent therapeutics course may have improved because of factors other than the pharmacology course redesign. Although students' demographics and overall undergraduate GPA did not significantly vary between the different classes included in this study, subjective factors such as students' motivation, background, and learning abilities may have affected their engagement and performance in the PharmD curriculum. Although we believe that other courses in the second- and third-year curriculum remained stable, there may have been subtle curricular changes made to those courses that we were not aware of. Second, this study focused only on student satisfaction in the pharmacology course and performance in therapeutics as outcomes of the pharmacology course redesign. There may have been other outcomes that could have been analyzed, such as performance on a cumulative high-stakes examination or performance in other courses. However, as described in the ACPE standards, knowledge from the foundational sciences such as pharmacology needs to be applied in order to solve therapeutics problems.¹ Hence, concepts in pharmacology are fundamental to pharmacists' understanding of therapeutics and their

ability to choose one therapeutic regimen over another.² Therefore, we believed that therapeutics mastery was closely linked to pharmacology and that students' ability to apply pharmacological concepts could be best assessed in the therapeutics course. Lastly, this study was conducted at a single institution, and thus the results might be not generalizable to other institutions.

CONCLUSION

The introduction of a course director responsible for overseeing the entire pharmacology curriculum resulted in improved student satisfaction within the course series and ensured that students developed a strong foundational knowledge of pharmacological principles. These results support the use of pharmacology educators in courses teaching foundational content that is critical to therapeutic decision-making.

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Appendix 1. Demographics of Students in PharmD Curriculum Before (Class of 2013 and 2014) and After (Class of 2015 and 2016) Redesign of the Pharmacology Curriculum

Characteristic	Class of 2013	Class of 2014	Class of 2015	Class of 2016
Age at admission, Mean (SD)	24 (3)	23 (3)	23 (3)	23 (2)
Gender, n (%)				
Male	16 (29)	10 (20)	20 (39)	18 (33)
Female	40 (71)	40 (80)	31 (61)	36 (67)
Race/Ethnicity, n (%)				
African American	2 (4)	0	0	1 (2)
Asian	31 (55)	32 (64)	32 (63)	33 (61)
Hispanic	2 (4)	0	1 (2)	1 (2)
Native American	0	1 (2)	0	0
White	11 (20)	8 (16)	17 (33)	18 (33)
Undeclared	10 (18)	9 (18)	1 (2)	1 (2)
Major, n (%)				
Natural Science	56 (100)	47 (94)	49 (96)	50 (92)
Social Science	0	2 (4)	1 (2)	2 (4)
Undeclared/Other	0	1 (2)	1 (2)	2 (4)
GPA, Mean (SD)	3.68 (0.16)	3.72 (0.13)	3.68 (0.14)	3.68 (0.15)

^a Comparisons between different classes of students was conducted using 1-way ANOVA with Bonferroni post-test (for continuous variables) and chi-squared tests (for categorical variables). No significant differences between any of the variables were detected. Undeclared ethnicity was excluded as a categorical variable for statistical analysis