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Student-led Learning in the Pharmaceutical Sciences Curriculum

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Abstract
Objectives: A challenge of primarily didactic courses lies in keeping students engaged in a potentially monotonous learning environment. The objective of this study was to test the effectiveness of incorporating student-led activities into the pharmaceutical sciences curriculum. This alternative approach to traditional lecture-based learning allows for student engagement and ownership of materials. These activities were incorporated into P1 Pharmacology, Biosystems, and Calculations courses.

Methods: A variety of student-led learning activities were conducted in three courses (n=78 students). Following each activity, students were asked to participate in a survey rating the effectiveness, relevancy, productiveness, and overall impression of the activity using a Likert scale of 1-5 (1= strongly disagree; 5 = strongly agree). Additionally, exam scores from relevant material were analyzed from the current semester and previous semesters as an indirect indication of success of the activity.

Results: For the three courses where student-led learning activities were incorporated, students responded that the topics were relevant to their studies (4.78), having the material presented in a different way was beneficial (3.89), and they would recommend conducting the sessions in the future (3.88). Exam scores did not show any statistically significant increase from the previous year, but qualitative data suggests the students benefited from the introduction of these activities.

Implications: Student-led learning activities in pharmaceutical sciences courses, as evaluated by student impressions, are a successful way of reinforcing classroom topics and presenting information from a different perspective. They also serve as a productive way to introduce learning variation even in large class sizes.

Disciplines
Curriculum and Instruction | Educational Methods | Pharmacy and Pharmaceutical Sciences

Comments
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Student-led Learning in the Pharmaceutical Sciences Curriculum

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Introduction

A challenge of primarily didactic courses lies in keeping students engaged in a potentially monotonous learning environment. The objective of this study was to test the effectiveness of incorporating student-led activities into the pharmaceutical sciences curriculum. This alternative approach to traditional lecture-based learning allows for student engagement and ownership of materials. These activities were incorporated into P1 Pharmacology, Biosystems, and Calculations courses.

Courses

Biosystems II: This course examines biochemical pathways for energy use and production, critical stages of human development and the cell cycle, and the host defense system.

Pharmacy Calculations: This class is an introduction to prescription terminology, systems of measurement and pharmacy calculations. Students apply appropriate mathematical concepts found within the practice of pharmacy, including prescription compounding and patient specific determinations.

Systems Pharmacology I: This course examines those topics that provide the foundation for the rational use of pharmacotherapeutic agents. Pharmacology and its two primary sub-disciplines, pharmacodynamics and pharmacokinetics, are examined extensively.

Methods

One student-led learning activity was performed in each of the three courses (Table 1). Following each activity, students (N=78) were asked to participate in a survey rating the activity using a Likert scale of 1-5 (1= strongly disagree; 5 = strongly agree) (Table 2). Additionally, exam scores from relevant material were analyzed from the current semester and previous semesters as an indirect indication of success of the activity.

Table 1: Activity Descriptions

Biosystems II	Pharmacy Calculations	Systems Pharmacology I
Activity: Metabolic Pathway Review	Activity: Worksheet Team Competition	Activity: Signal transduction student review presentations
Students randomly picked molecule names and had to identify and assemble into groups based on the metabolic pathway the molecule belongs to. Groups then assembled into pathways and reviewed their pathway and the involvement of their molecule in the pathway to the rest of the class.	Students were divided into teams of 5-6 students. Each team was given the same worksheet with 3 calculation problems to solve as a team. The first team with all the correct answers was awarded 3 points, with decreasing points for each team thereafter. Incorrect answers disqualified the team for that round of point collection.	Students were divided into teams of 5-6 students. Each team was assigned a signal transduction pathway to review for the class. Groups were given time in class to prepare their presentations. Each group then gave a 5 minute presentation to the class regarding the important features of their pathway.

Table 2: Activity Survey Questions

Q1. This review session helped me to better understand the concepts associated with [the topic of the activity].
Q2. Working in groups was a productive use of my time.
Q3. The topics covered were relevant to my studies.
Q4. Having the material presented from a different perspective was beneficial.
Q5. I would recommend conducting this type of review session in the future.
Q6. Please provide any additional comments you feel would be helpful.

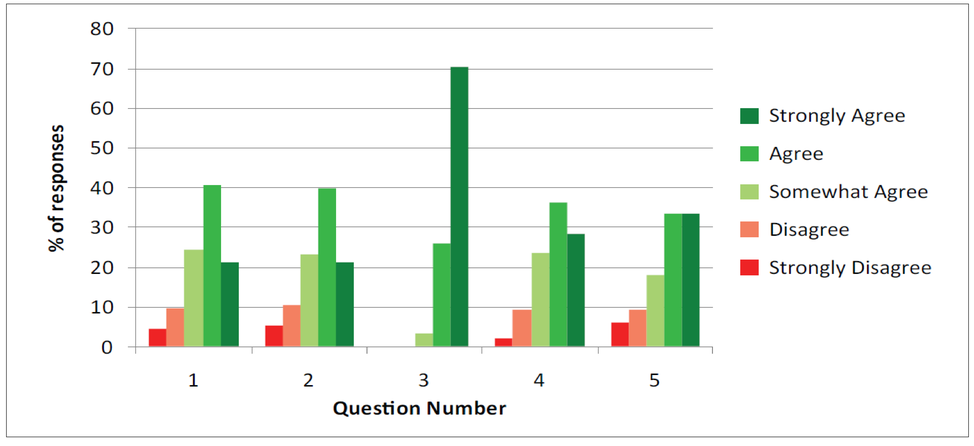

Figure 1: Combined Student Response to Survey Questions
Using the Likert Scale of 1-5 (1=strongly disagree; 5= strongly agree), students rated the activities using questions 1-5 in Table 2. Greater than 84% of the students somewhat agreed, agreed, or strongly agreed with all questions.

Table 3: Student Answers (Likert Scale; 1=strongly disagree; 5= strongly agree)

Question	Average Survey Score (±SEM)
1	3.73 ± 0.32
2	3.70 ± 0.33
3	4.78 ± 0.12
4	3.89 ± 0.25
5	3.88 ± 0.37

Student Comments

"I think these presentations really break up the monotony of lectures so it's helpful in a psychological way."

"The interacting helps make class work easier to focus on."

"This was a fun change of pace that truly facilitated my understanding of cell receptors"

Results and Implications

For the three courses where student-led learning activities were incorporated, students responded that the topics were relevant to their studies (4.78), having the material presented in a different way was beneficial (3.89), and they would recommend conducting the sessions in the future (3.88) (Table 3). In addition, greater than 84% of students somewhat agreed, agreed, or strongly agreed with all questions (Figure 1). Scores from corresponding exams did not show any statistically significant increase from the previous year, but qualitative data suggests the students benefited from the introduction of these activities.

Student-led learning activities in pharmaceutical sciences courses, as evaluated by student impressions, are a successful way of reinforcing classroom topics and presenting information from a different perspective. They also serve as a productive way to introduce learning variation even in large class sizes.