

Pharmaceutical Calculations Instructional Strategies to Impact Competency Outcomes

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Objective:

Pharmaceutical Calculations is a very fundamental course that is taken by all Doctor of Pharmacy students in Schools and Colleges of Pharmacy in United States. The objective is to determine if novel instructional modifications in Pharmaceutical Calculations can impact downstream competencies (Pharmaceutics/NAPLEX).

Study Design and Methods:

Various instructional changes were implemented *incrementally* from the Class of (CO) 2023 to 2026. Some of the changes incorporated were:

- The time to practice problems in class was increased.
- Practicing problems in class was mandated and students were given incentives for perfect attendance.
- Students were provided with a printed handout for the lecture
- Faculty developed and provided customized software tutors to help students practice multiple times, and administered clinically relevant examples.
- Faculty also developed and implemented the “concentration cross” to teach conversions between specific concepts.
- Students had to complete a set of “Homework problems” and submit every week. These Homework problems were hand graded
- Exam questions were all fill in the blanks.
- Several one-on-one tutoring sessions with the faculty, were held for the students that requested for additional help.
- Students were given a graded quiz every week
- A new decompressed curriculum was also introduced
- The faculty teaching the course had an increased level of experience in the field.

To determine the impact of the incremental changes, Annual student performance was assessed on longitudinal questions, held in confidence to ensure naivety, from specific downstream segments within our curriculum and reported herein.

Thus, overall an optimized teaching method was used for the CO 2026. We would like to evaluate if implementing these instructional modifications in Pharmaceutical Calculations course in Q1 can impact downstream competency in Courses like Pharmaceutics.

Results:

From CO 2023 to CO 2026, the average student performance *on calculation specific questions* in our downstream Pharmaceutics course, improved significantly (from 46% to 82% correct). For exams within Pharmaceutics weighted heavily in calculations, student performance improved dramatically over the period (average percent correct for calculations questions improved from 58% to 80%). Further, the resulting average Pharmaceutics *course* grades improved by 10 points over the same period. In alignment, the percentage of deficient grades (D or F) decreased significantly from 76% deficient to 22% in the period. The impact was also noted in the number of high performers as 26% of students in the CO 2026 earned an A for the course compared to 0% in the CO 2023. These results are detailed on Table 1

Table 1: Longitudinal (downstream) Competency in Pharmaceutics:

	CO 2023	CO 2024	CO 2025	CO 2026
Average student performance <i>on calculation specific questions</i> on Pharmaceutics Exam	46%	69%	74%	82%
Average percent correct for calculations questions on Pharmaceutics Exams (same material)	58%	72%	79%	80%
Average Pharmaceutics <i>course</i> grades (same material)	F	C	C	B
% Deficient (D or F) (for calculation specific questions on Pharmaceutics Exams)	76%	27%	24%	22%
% A	0%	26%	27%	26%

Conclusion:

Changing the method of teaching calculations increased student performance in calculations related content in Pharmaceutics. Thus, as hypothesized, the improved calculations competency *dramatically* impacted longitudinal performance.

References:

Medha D. Joshi , Eytan A. Klausner Course design, delivery, and assessment strategies for pharmaceutical calculations course in a doctor of pharmacy program: A review Currents in Pharmacy Teaching and Learning 14 (2022) 526-535