University of California, San Francisco

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Pharmacology Exam Flashcards: Friend or Foe? Exam Performance & Student Opinions

Rupa Lalchandani Tuan, PhD & Marieke Kruidering-Hall, PhD
Department of Cellular & Molecular Pharmacology, University of California, San Francisco, CA
Rupa.Tuan@ucsf.edu; Marieke.Kruidering@ucsf.edu

Background

- Pharmacology content is taught using multiple teaching strategies nationally and at UCSF.
- We need to train learners to be able to apply the information that they will have at their fingertips as 21st century physicians.
- Ongoing research aims to identify specific strategies that best promote learning and application of pharmacology knowledge.[1,2]
- The UCSF Bridges curriculum is an integrated, organ systems-based curriculum. Students learn via multiple modalities (see **Fig 1**).

Purpose

- We examine the efficacy of specific teaching modalities on application of pharmacology knowledge on Open Ended Questions (OEQs) on summative block exams.
- We investigate impact of and student attitudes towards resource-enhanced exams.
- We report on exam performance in which resources were provided in order to mimic "real life", favoring application over memorization of facts.

Methods

- Class of 2021 in Foundational Sciences 1 (F1) spanning 2017-2018 (n=149).
- Efficacy of teaching modality was measured by the number of students passing the pharmacology components on OEQs in the following F1 blocks:
  - **GS** – Ground School
  - **ABC** – Airways, Blood, Circulation
  - **BMB** – Brain, Movement, Behavior
  - ***REGN** – Renal, Endocrine, GI, Nutrition
  - ***PHD** – Pathogens, Host Defense
- Number of students passing each pharmacology question were averaged per block. Averages were compared using a Chi-squared test with Yates correction.
- For research purposes, OEQ performance was scored by trained faculty using a holistic rubric. Answer quality was assigned a score from 1-6. Scores were averaged and compared using repeated measures ANOVA.
- *Flashcards containing mechanism of action and adverse effects were provided as resources on exams in these blocks (indicated with an asterisk).
- We collected student data using a 9-item Qualtrics survey at the end of F1 and calculated descriptive statistics.

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Results

Teaching Modalities

- 79-91% of students passed pharmacology OEQs on summative exams in all Foundational Sciences 1 blocks, despite different modalities used per block.
  - Comparison of the number of students passing pharmacology OEQs across blocks yielded only a difference between GS and PHD (P = 0.02, Chi Sq test w/Yates correction). ***Fig 1A***
- Answer quality scores (on a scale of 1 to 6) show small, but statistically significant differences between all blocks (Repeated Measures ANOVA). ***Fig 1B***

Resources on Exam

- Providing resources on the REGN and PHD summative exams did not result in higher OEQ answer quality scores when compared to GS, ABC, and BMB. ***Fig 1B***
- 46.4% of survey respondents preferred having flashcards on exams. ***Fig 2***

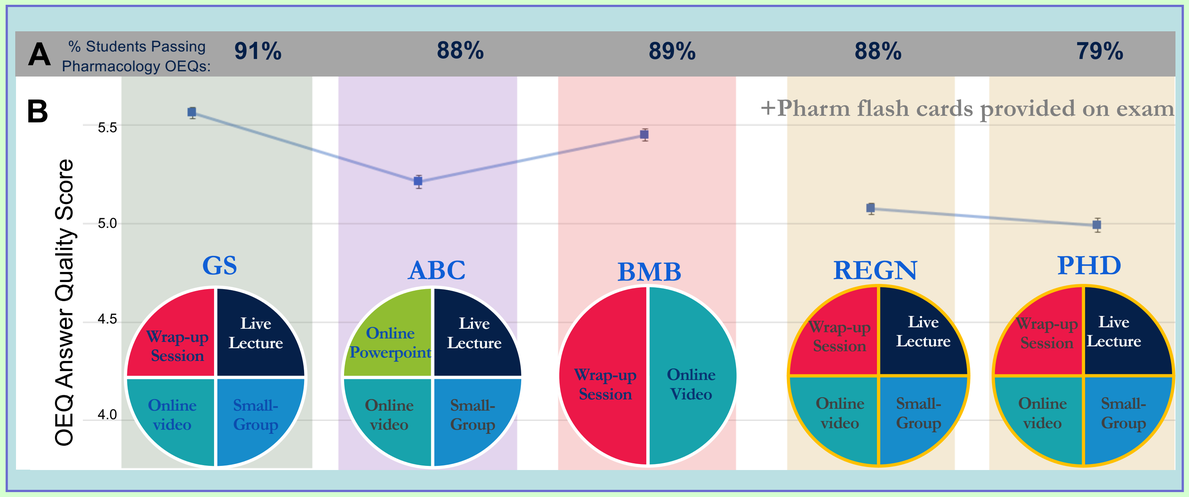


***Figure 1: OEQ performance across blocks**. (**A**) Percentage of students passing pharmacology OEQs across five organ-system based blocks (n = 149). (**B**) Average +/- SEM of pharmacology OEQ answer quality. Pie charts indicate modalities used (not proportional). Beige background indicates blocks (REGN, PHD) in which pharmacology resources were provided on summative exams. All blocks are significantly different from each other (Repeated Measures ANOVA).*

#2: "Would you have preferred to have had flashcards on all exams in all blocks in F1?"

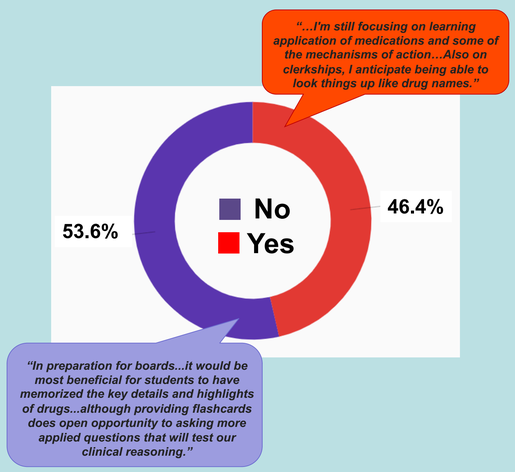


***Figure 2: Responses to survey item #2.** Students express mixed preferences for resources on exams. (n=36)*

#3: "What do you think will be optimal for your learning of pharmacology in F1 (and thinking ahead to clerkships and Step1)?"

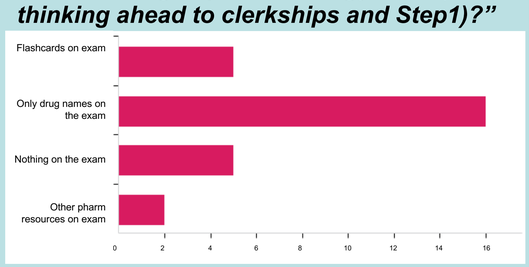
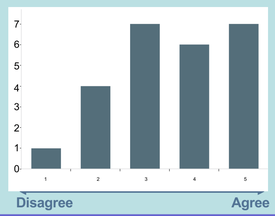


***Figure 3: Responses to survey item #3.** Preferred exam resources; 57% preferred only drug names. (n=28)*

#4: "I worry that having flashcards available on the F1 exams hurt my preparation for Step 1"



"Having flashcards before the exam would help A LOT, but having flashcards during does not mimic what Step 1 exam will be like!"

"Step 1 is far away, over a year, I certainly wasn't going to remember drug names for a year."

"A high score on Step 1 does not necessarily signify a real understanding of medicine. The pre-clinical years should help prepare for the clinical years and doctoring, not to take a test..."

***Figure 4: Responses to survey item #4.** Average is 3.56 +/- 0.23 on a scale of 1=disagree to 5=agree (n=25). Representative quotes are shown.*

Discussion & Limitations

Discussion:

- All teaching modality combinations include an opportunity for application and achieve similar, high OEQ performance.
- Application can be achieved in large (BMB) or small group (ABC) settings. Student comments indicate a preference for small group application.
- Providing resources on the exam did not enhance performance, suggesting OEQs test application and not recall.
- About half of the respondents preferred to not have exam resources, while half did prefer to have exam resources.

Limitations:

- Other confounding factors: course difficulty, exam difficulty, fatigue.
- Time spent with each modality, overlap of modalities used per topic.
- Ceiling effect from high overall performance; 1 year, 1 institution.
- Interrater reliability, though faculty are trained on use of the rubric.
- Inherent bias in who self-selects to participate in optional surveys.

Acknowledgements

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1 Brown, P.C., Roediger, H.L., McDaniel, M.A. (2014) Make it stick: the science of successful learning. *The Belknap Press of Harvard University Press.*

2 Engels, F. (2018) Pharmacology education: Reflections and challenges. *European Journal of Pharmacology.*