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### Background

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- We need to train learners to be able to apply the information that they will have at their fingertips as 21st century physicians.
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### 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.

### 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 with/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

### Discussion & Limitations

- 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.

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