



Evaluation of Complementary Review Material in Enhancing Medical Student Learning

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INTRODUCTION

Geisinger Commonwealth School of Medicine (GCSOM) is dedicated to educating aspiring physicians from differing educational backgrounds and varied life experiences in the core concepts and skills that allows them to become effective care providers. To achieve this goal, it is helpful to provide students individualized curricular learning pathways to accomplish standardized knowledge milestones. In this poster, we describe a pilot study, in which we provided second year medical students (MD2) voluntary access to Step-1-level standardized curricular material, so-called Bricks (see Methods below). We are asking the question if the Bricks benefit students' self-directed learning experience, impacting their academic performance. We hypothesize that student performance will improve for Brick users and that the magnitude of improvement will be greater for low performers compared to high performers.

METHODS

What is a Brick (ScholarRx™)?

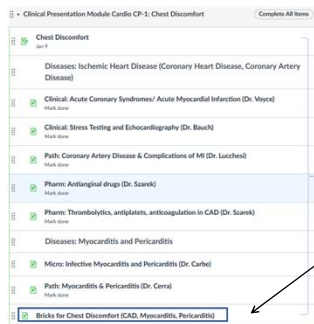
- Bricks are Step-1-level standardized curricular items
- Bricks consist of Learning Objectives, Narrative text and Self-assessment items
- Bricks contain core content around basic science concepts (e.g. volume-pressure loops) around a clinical concepts (e.g. ischemic heart disease).

CardioPulm Course:

- A 6-week course
- Flipped classroom approach.
- Organized into 10 Clinical Presentations (CPs)
 - For each CP, pre-work (podcasts and readings) is on Canvas.
 - Class time is used for active learning sessions.

Brick Integration:

- A link to the page of pertinent Bricks was included in the module for each CP (example below).
- There were 15 pages of Bricks (10 Cardio and 5 Pulm) (see below)
- Overall, there were 137 Bricks (87 Cardio and 50 Pulm).



Bricks for Chest Discomfort (CAD, Myocarditis, Pericarditis)

- Acute Coronary Syndromes
- Ischemic Heart disease foundations frameworks
- Angina
- Myocardial Infarction
- ECG Interpretation of Myocardial Infarction
- Serum markers of Myocardial Infarction
- Pharmacotherapy of Acute Coronary Syndrome
- Myocarditis, Pericarditis
- Pericarditis
- Pericardial effusion and cardiac tamponade

Qualitative Data Analysis:

- All students completed a questionnaire on the usefulness of the Bricks.
- Four students were incentivized to keep a log book of their Brick use and to participate in a Focus group.
- Exemplary comments from faculty and staff interviews are included herein.

Quantitative Data Analysis:

- The percent difference between the block exam scores and the average academic Year-1 performance was calculated for each student.
- Comparisons included Brick and Non-Brick users in different academic years (Figures 1 & 2; 2019 versus 2016-2018) and in different Systems blocks (Figures 3 & 4; CardioPulm versus DMSK, GI, Renal).
- The comparison Year-1 courses included Cell & Molecular Biology, Human Structure & Function and Foundations which are lecture based for the most part.
- Figure columns are averages. Error bars are Standard error of the means. T-tests were used to determine significant differences between the means of two groups.

RESULTS

Student Brick Access

- 91% (96 of 106 MD2 students) accessed the Bricks voluntarily.
- Average access of the 15 Canvas Bricks pages on average 16 times (variation 1 to 118 times).
- Average access was higher for lower performing students in Year-1:
 - 18.2 for performance <85%; 11.6 for performance ≥85%
- Average access was higher for lower performing students in the 6 CardioPulm IRATs:
 - 18.2 for performance <76%; 13.3 for performance ≥76%

Student Brick Use and Feedback

- Non-Brick Users:
 - "... I was too worried about resource overload..."
 - "... I had more than enough with class material, Pathoma, Boards & Beyond,"
 - "... I was drowning with the volume of class material."
- Brick Content:
 - "... a few presented challenging material in such a clear manner I wouldn't have understood it ..."
 - "... they are time consuming to go through on top of all the lectures ..."
 - "... it's impossible to use it as your only resources as you will miss out on many details."
- Brick Organization:
 - "... I personally loved them. They matched up with all the topics per week..."
 - "... I liked they provide the material in a condensed format that can be easily read ..."

Academic Performances Brick versus Non-Brick Users

CardioPulm Academic Performances in Different Years

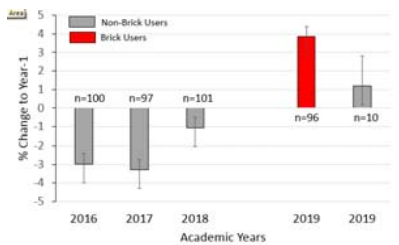


Fig. 1: Performance Difference CardioPulm versus Year-1

In 2019, the average value for Brick users was +3.9% and +1.2% for non-Brick users. In non-Brick years of 2016-2018, the average values were -3; -3.3; and -1.1%, respectively.

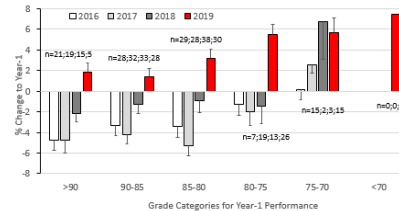


Fig. 2: Performance Difference CardioPulm versus Year-1 Grade Category

For Brick users in 2019, performance differences were incrementally larger for lower performing students. For non-Brick users in 2016-2018, there was a similar but less distinct trend.

Academic Performances in Previous Systems Blocks

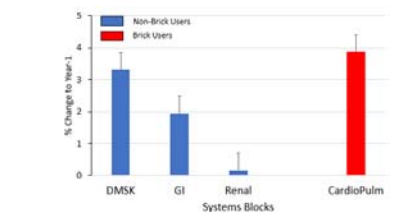


Fig. 3: Performance Difference of different Systems Blocks versus Year-1

In the 2018/2019 academic year, performance differences in the CardioPulm block were similar to the Dermatamusculoskeletal (DMSK) block, and higher compared to the Gastrointestinal (GI) and Renal blocks.

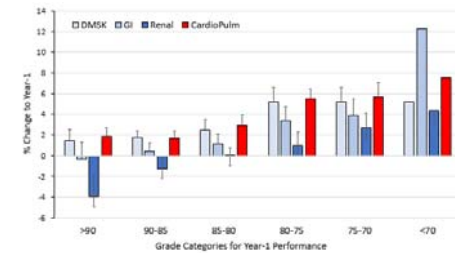


Fig. 4: Performance Difference of Systems Blocks versus Year-1 Grade Category

All blocks showed similar trends of incrementally larger differences for lower performing students.

Faculty and Staff Feedback

- Faculty Involved in the CardioPulm Block:
 - "... Some content was exactly right-sized and well presented, while others left room for improvement. Going forward, it would be good to better integrate the content with our material..."
- "... students commented on the usefulness of the Bricks when working with us at the Center for Learning Excellence. I could imagine incorporating them into study plans or remediation..."

Study Limitations

- The presented data are only from one class in two disciplines (cardiology and pulmonology).
- In 2019, the CardioPulm block was extended from 5 to 6 weeks, based on feedback about the block.
- Brick use was monitored as access of Canvas pages that contained the individual Bricks as downloadable pdf files. If students downloaded and shared the Bricks, this would confound the results.
- The time spent studying the Bricks is not represented in the data.

DISCUSSION & CONCLUSION

Brick Use and Satisfaction

- Most students used the Bricks despite the lack of active encouragement by faculty.
- Many Brick users positively commented on their usefulness for learning.
- Non-Brick users had no need and/or were overwhelmed by additional review material.
- Students, faculty and staff liked the content of many Bricks, but also commented on inconsistencies between and lack of depth for some Bricks.

Academic Performance

- Student academic performance improved in the CardioPulm block (+Bricks) compared to previous years (-Bricks). In the same year, performance in the CardioPulm block (+Bricks) was higher compared to GI and Renal and similar to DMSK performance (all -Bricks). Results indicate that Bricks might have been beneficial to learning, but that other non-defined factors likely contributed as well.
- The benefit was larger for poor performing learners compared to high academic performers but such a gradation was also seen for other blocks without Bricks.

Future Considerations

- The results of our pilot study justify continued study of whether the use of the Bricks in students' self-directed learning affects their academic performance.
- Future studies will need to confirm the one-year trend and distinguish potential learning benefits due to Bricks from other contributing factors.
- Whether the Bricks will be useful for longitudinally connecting normal and abnormal concepts when taught in different classes and for academic tutoring and remediation.

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