

The Equitable Impact of Coaching Reports on BSPS Students Self-Directed Learning and Pharmaceutical Science Exam Performance

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INTRODUCTION

Disparities persist in STEM retention rates across various demographic factors. The incidence of dropping a STEM major is higher in Black and Latinx students than their white counterparts. Gender disparities also persist in areas of examination performance and science identity. Researchers noted that men often feel more comfortable engaging in class discussion and taking on leadership role in classrooms that are predominantly male enrolled and male instructed. Additionally, first generation students report not having the same exposure to time management and metacognition-driven study skills as continuous generation students, leading to disparities in examination performance and overall success in college.

AIM

To promote persistence in pre-health professionals by guiding learning in the pharmaceutical sciences

To promote self-directed learning with metacognitive coaching reports after semi-cumulative and scaffolded exams

To provide individualized evidence-based study methods, content specific feedback and insights on Bloom's Taxonomy

METHODS

Investigators captured exam performance and exit survey data from BSPS students enrolled in a pharmaceutical sciences course from AU19-AU22. Data from AU19-SP20 provided historic controls prior to implementing individualized coaching reports. From AU19-SP20, investigators implemented 3 high-stakes exams without metacognitive coaching in the formative feedback reports for 3 high-stakes exams. From AU21-SP22 investigators implemented 6 low-stakes exams with metacognitive coaching and incorrect question rationales added to the reports. Data across each of these semesters was compared to analyze the impact of metacognitive coaching reports on student's academic success.

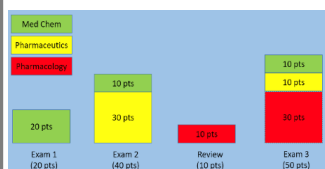


Figure 1 (Above): Pre-Implementation Exam Breakdown

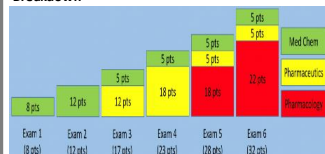


Figure 2 (Above): Post-Implementation Exam Breakdown

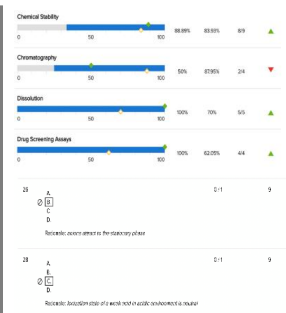
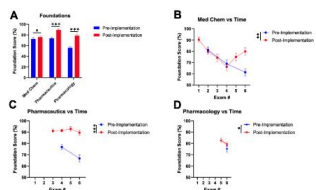


Figure 3 (Above): Metacognitive Coaching Reports Examples

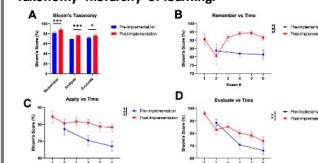
RESULTS

Fig. 4: Metacognitive coaching reports combined with scaffolded semi-cumulative exams enhances content knowledge retention



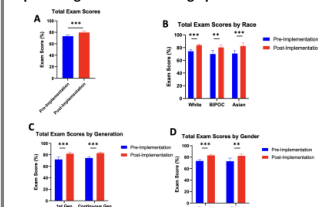
A) Med Chem (72.5% vs 76.0% mean, $p < 0.05$), Pharmaceutics (73.7% vs 89.3% mean, $p < 0.000001$), Pharmacology (55.95% vs 78.8% mean, $p < 0.000001$); unpaired student t-test, 95% CI displayed. B) $p < 0.01$ mixed model, mean and 95% CI displayed. C) $p < 0.0001$ mixed model, mean and 95% CI displayed. D) $p < 0.05$ mixed model, mean and 95% CI displayed

Fig. 5: Metacognitive coaching reports combined with scaffolded semi-cumulative exams improves acquisition of Bloom's Taxonomy hierarchy of learning.



A) Remember (81.2% vs 88.1% mean, $p < 0.001$), Analyze (69.7% vs 76.4% mean, $p < 0.001$), Evaluate (71.7% vs 76.4% mean, $p < 0.05$); unpaired student t-test, 95% CI displayed. B) $p < 0.0001$ mixed model, mean and 95% CI displayed. C) $p < 0.0001$ mixed model, mean and 95% CI displayed. D) $p < 0.01$ mixed model, mean and 95% CI displayed

Fig. 6: Metacognitive coaching reports combined with scaffolded semi-cumulative exams created equitable gains across demographic factors



A) 73.2% vs 79.7% mean, $p < 0.001$ student t-test; 95% CI displayed. B) White (74.2% vs 83.9% mean, $p < 0.000001$), BIPOC (69.9% vs 80.2% mean, $p < 0.01$), Asian (70.6% vs 82.4% mean, $p < 0.001$) student t-test; 95% CI displayed. C) 1st Gen (71.9% vs 82.1% mean, $p < 0.00001$), Continuous Gen (74.5% vs 83.0% mean, $p < 0.000001$) student t-test; 95% CI displayed. D) Female (73.4% vs 83.0% mean, $p < 0.000001$), Male (72.9% vs 82.3%, $p < 0.01$) student t-test; 95% CI displayed

CONCLUSION

ExamSoft's individualized coaching reports positively impacted student examination scores across several different areas. In pre-implementation data, over time the number of correct answers in each foundations area saw a steady decline. Post-implementation, foundation scores decline was minimized, as evidenced by the trend in correct answers for Pharmaceutics content, or increased again as indicated by the trend for Medicinal Chemistry. Bloom's Taxonomy categories of remember, apply, and evaluate all saw noticeable improvement. For higher levels of Bloom's Taxonomy, such as apply and evaluate, comparisons between pre- and post-implementation data demonstrated that metacognitive coaching reports and a greater number of exams minimized the decline of correct answers over time for these two categories. Investigators will continue to research to determine which marginalized populations benefited most from this new teaching approach. Data indicates that first generation, along with BIPOC and Asian students, are more positively impacted by this tool, creating more equitable gains in their exam performance. First generation students saw an over 10% percent increase in their total examination score, while continuous generation students saw a less than 10% increase, demonstrating a close in a achievement gap between these two populations. BIPOC and Asian students also saw an over 10% increase in their total examination scores from before metacognitive coaching reports, while white students saw not as great of an increase.

Acknowledgements

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