NARESH RAMESH & VELSI PATEL, Department of Biology, West Virginia University Institute of Technology, Beckley, WV, 25801. Leveraging Longitudinal Gamified Assessment Data to Identify and Resolve Conceptual Thresholds in Undergraduate Anatomy and Physiology

Objective: This study evaluates the efficacy of gamified formative assessment (Kahoot!) in identifying persistent student misconceptions and measuring the impact of data-driven instructional interventions—including weekly study guides, clinical concept mapping, and step-by-step ECG interpretation protocols—across multiple academic terms
Methods: Longitudinal data were collected from weekly quizzes in an undergraduate Human Anatomy and Physiology course. Analysis compared two cohorts: Year 1 (n=56 unique attempts) and Year 2 (n=97 unique attempts). Metrics included mean class accuracy, item-level difficulty, and student engagement (participation reach and response fluency). Statistical significance was determined by using independent samples t-tests.
Results: Overall mastery increased significantly between years. Muscular System accuracy rose from 67.9% to 87.8% ($p<0.001$), and Blood & Hemostasis rose from 73.3% to 84.4% ($p=0.059$). Item-level analysis identified "Persistent Red Zones" in complex functional logic (e.g., Aspirin's mechanism), while targeted interventions for clotting synthesis and muscle organization resulted in mastery gains exceeding 40%. Despite a 173% increase in student participation during Year 2, response speeds remained stable or improved, indicating high scalability and cognitive fluency.
Conclusion: Results indicate that longitudinal tracking of gamified data allows educators to distinguish between stable mastery and "threshold concepts" requiring pedagogical pivot. While general engagement remains high as cohort size increases, specific cognitive traps (e.g., pharmacological mechanisms) persist, suggesting that gamification is most valuable as a real-time diagnostic for refining instructional delivery and resolving deeply rooted misconceptions.