

University of Michigan **Provost's Teaching** Innovation Prize

2019 WINNER



AUGUST EVRARD Arthur F. Thurnau Professor Physics and Astronomy, LSA evrard@umich.edu

With support from many contributors, including: Rachel Niemer, Amy Homkes-Hayes, Caitlin Holman (Academic Innovation) and the PR development team (pictured below); John Leasia, Noah Botimer, James Eng (U-M Library Technology Incubation Group); Anthony Whyte, Zhen Qian (ITS Teaching & Learning); Toby Eckhause, Jens-Christian Meiners, Tim McKay, Dave Gerdes, Angela Sands (Physics); Jadwiga (Dotie) Sipowska (Chemistry); Brenda Gunderson (Statistics); + the instructors of all the courses that joined PR since 2013.

Special thanks to the original project crew of Mike Mills (U-M Engineering Physics alum, 2014) and David Winn (Lecturer III, Physics)



Academic Innovation staff who are supporting PR in different ways. Left to right: David Nesbitt, Software Portfolio Manager; Holly Derry, Associate Director, Behavioral Scientist; David Corneail, User Experience Designer; Sophia Zhou, User Experience Designer; Ben Hayward, Associate Director, Software Development & User Experience Design; Gus Evrard, Evangelist and Architect; Yun Hsiao, User Experience Design Student Intern; Kyle Schulz, Data Scientist; Ollie Saunders, Developer; Ke Yu, Developer; Marissa Reid, Student Program Coordinator

Sponsors:

Office of the Provost

Center for Research on Learning and Teaching (CRLT)

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Problem Roulette: A Stress-Free Practice Zone Supports Student Success

Innovation Description

Problem Roulette (PR) is a study service that offers topical access to a library of locally-authored exam problems in selected foundational courses at the University of Michigan. Research is clear that the more students use formative assessment tools, like practice problems, and use those tools over time, the better they understand the material. Because PR is not for credit, students can use it without risk of failure, as early and often as they like, receiving immediate feedback and guidance on every question. In the first five years of the project, more than 60,000 students aggregate bank of roughly 10,000 problems across the full set

attempted over 7,000,000 question instances from an of courses served. Students are prompted to choose a topic to focus on, and then are randomly served questions from actual previous exams — a realistic preview of their future assessments. With the group-work feature, students can work on the same problems at the same time and then compare notes and strategies to teach one another. In the individual mode, students who need a lot of practice can get it and see how their performance matches others, targeting only the topics in which they need support.

As the system grows, the data is being leveraged to better understand how students use formative assessments, providing insights into the relationship between student practice and learning outcomes to further enhance the learning environment in foundational courses.

Examples of Teaching Innovation

Roblem Roulette					
Statis	Select Different Course Reset Selected	n 1 practi select fro Topics	ice, yo om top ^{Use Selec}	u will ics 1 to 5!	
	Select All	Remain	ing Proble	ems	
	1. Summarizing Data	44/44	Reset	Wow! There are 199 recent	
	2. Sampling, Studies, Experiments	20/20	Reset	exam questions on exam 1 topics that will be randomly selected from and given to	
	3. Probability	14/15	Reset		
	4. Random Variables	38/40	Reset	you for more practice:	
	5. Learning about a Population Proportion	80/80	Reset		
	6. Learning about the Difference in	13/14	Reset		

Population Proportion

Annotated screenshots from a personalized Winter 2014 message that encouraged students to try Problem Roulette.

Student Comments

After identifying areas of weakness on Problem Roulette, I could target these weaker sections by reviewing my notes and then returning to Problem Roulette to see if my understanding of these topics improved.

Because the questions are extracted from previous exams, PR gives me a good idea of what to expect in the future.

Being able to see whether I am at the same pace as other students motivates me to improve my understanding of the material or challenge myself with more difficult concepts.

I absolutely love that any questions you do incorrectly are kept in the pool that can be randomly selected from again. It takes many questions, and many tries to build an enduring understanding of the idea, not just seeing once and forgetting.

PR was an essential part of my studying regime for both Physics 235 (quantitative) and MCDB 310 (very conceptual). The practice problems allowed me to explore this material from different angles not covered explicitly during lecture. The extra practice problems helped to improve my homework and my exam scores.





Score result on learning impact based on students enrolled in PHYS 240 in Fall 2012. Evrard, A. E., Mills, M., Winn, D., Jones, K., Tritz, J., & McKay, T. A. (2015). American Journal of Physics, 83(76). https://doi.org/10.1119/1.4894061