

Random-Sampled Exams for Better Learning

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Brown, Roediger, and McDaniel (2014) describe a number of principles that underlie what they call “the science of successful learning.” These include that learning is more successful if it involves effortful retrieval practice, interleaving older and newer concepts, and elaborating concepts in one’s own words and connecting them to prior knowledge. With the onset of online teaching in spring 2020, we had the dual goals of (1) improving student learning according to the above principles and (2) developing a way of conducting exams in a way that would be feasible, effective, and nonintrusive in an online setting (e.g., avoiding ‘Big Brother’ type software, but encouraging true student ownership of the concepts).

We developed a system of randomized exam questions that can be used for either oral or written exams that we believe accomplishes these goals. After each class session, sample exam questions based on the day’s materials are posted. These questions almost always ask students to *explain* a concept (e.g., “Explain how you would figure out the Swahili word for this English gloss” or “What do the two signs below tell you about the phonological status of handshape in ASL, and why?”). These questions are based on the datasets available to students on handouts, homework assignments, or readings; some have been directly discussed in class, but others have not.

On the back end, we maintain a database of these questions, labelled with topic, difficulty level, and source. Exams themselves consist of only 2-6 randomly selected questions for each student -- the benefit of the exam is largely in the students’ preparation for it rather than exhaustive testing. Our freely available, open-access Python script imposes certain criteria on the questions (e.g., particular distributions of topics, difficulty levels, source dates), and is customized to make sure that a given student does not get the same question or even type of question multiple times in the semester, and can be further customized to ensure that students who often work together also do not receive the same questions. The script generates .tex files for each exam that can be compiled into .pdfs, which in turn can be used for either oral or written exam presentation.

We have used this system for two iterations of an introductory phonetics / phonology course, one with 40 students (two oral exams) and one with 140 students (one oral and two written exams), and have been very happy with the results in both cases. The students are supported in their learning, because they have access to the possible exam questions throughout the term, and the format leads them naturally to follow the principles for successful learning in their studying. The questions also give them an easy way to form study groups and help each other, which is an added bonus in an age of online learning when many students may otherwise feel isolated. The randomized, personalized nature of the exams, along with the fact that all exam questions are available to students at all times and exams themselves are ‘open book,’ maximizes exam integrity.

On average, scores for these exams were relatively comparable to scores on ‘regular’ exams from previous (in-person) semesters, and both oral and written forms of these exams show a broad range of scores, allowing students to demonstrate their actual degree of competence. While oral exams are new to many students and can cause anxiety, a sizable number of students reported finding the experience enjoyable and beneficial, as it provides a level of direct connection with the instructor and allows students for whom writing is an added burden to have an alternative exam medium.

Reference

Brown, Peter C., Henry L. Roediger III, and Mark A. McDaniel. 2014. *Make it stick: The science of successful learning*. Cambridge, MA: The Belknap Press of Harvard University Press.