

## **Weekly Small Quizzes over Three Large Exams: Did the Practice Match Theory?**

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Because I switched from teaching a large introductory biology course in person to a synchronously online format due to the pandemic, I decided to adopt a weekly quizzing strategy over a few large exams. For years, I have followed the traditional format of having a few exams during the semester and a final at the end of the semester. For years, I have read about the value of smaller stake quizzes to reinforce concepts, to help with student comprehension, and to grow student confidence with the material. For years, I have wanted to try this technique, and for years I stayed with the standard. But when COVID forced us all to rethink issues surrounding accessibility, technology, fairness, and overall student learning, I decided this was finally the time to try the technique.

I was excited to see, with my own students, if the testing effect could be realized. The testing effect refers to people retrieving information in a way that they pull information from their memory and use it. This process reinforces learning and comprehension (e.g., Rowland, 2014). By asking the students to take weekly, numerous quizzes, they would be pulling on that retrieval component more frequently than for two exams and a final. Additionally, test-potentiated new learning (TPNL) is the finding that testing people often improves their memory of that material and allows for a more effective learning process on subsequently presented material (Wissman et al., 2011). I was hoping the repetitive nature of weekly quizzes in my course would help build on the students' baseline knowledge in a positive way.

My original plan was to have students take short quizzes on their own time before class started. The class met on online, Tuesdays and Thursdays, so sometime on Monday, the students were to take the quiz on their own time. The quizzes were timed, and the length depended on the number of questions asked. The quizzes started off with only 5 to 6 questions worth a total of 10 points, but eventually built up to 18-20 questions valued at a total of 40 points at the end of the semester. The twelve assigned quizzes were to be taken using the honor system.

The first quiz went great - or so I thought. Five different students contacted me about their frustration with their peers cheating. Students were using social media to send answers to each other. I was devastated. I switched to having students taking the quizzes with me in Zoom for the first 20 minutes of class. This limited the span of time in which to take the quizzes and also allowed for students to ask me questions if they needed clarification (through chat). I'm not sure if it prevented all cheating, but it certainly made students think twice. I did not receive complaints about cheating from students, and the feedback I did receive through a short anonymous survey was positive. Students found this format satisfactory, with being able to ask questions if necessary, but some did find it stressful.

Overall, students seemed to love the smaller stakes and consistent timing format of the quizzes. When surveyed, they said they preferred this method over larger stakes and fewer in number mid-term exams. They also commented that they were prevented from "forgetting" material because they were

“forced” to study on a regular basis. I was thrilled with their responses and overall embrace of the weekly quizzes. Although the average score for one of these quizzes was lower than the average score in previous semesters for a larger exam, it still felt (in a subjective way) that students were embracing the material more and had achieved satisfaction with the course and their learning. My students’ enthusiasm for learning the material was high.

But then, the final exam came. I naively thought, “This will be straight forward for the students. They have been studying for the final exam the entire semester.” What I didn’t calculate into this argument was that the final exam not only covered material students had been quizzed on all semester, but it also contained new material that they hadn’t been quizzed on yet. This is where their grades fell off. The average score on the final was 10% lower than the average of the quizzes - a drop of a whole letter grade! On the one hand, I was surprised the scores dropped so much on the final. Perhaps the students didn’t apply the study techniques that helped with the quizzes throughout the semester. On the other hand, perhaps the lack of repeated exposure and quizzing to the last portion of material made the difference in this lower grade. If that was the case, the results are not surprising.

Upon reflection, analysis of data, and discussion with colleagues, I still think the strategy of having smaller weekly quizzes helped the majority of students. What can’t be seen with just an average reported scores are the details of individual students and situations. The course was taken during COVID months, when many students were stressed. Some decided to take the course as “pass/fail” and told me they didn’t study as they would normally. From the positive comments and the overall feeling of support conveyed by the students (and expressed by students to me and the TA’s), this environment appears more conducive to student learning. The students in this virtual classroom seemed more optimistic, despite their anxiety and stress surrounding COVID, compared to student attitude of previous semesters. In fact, the virtual interactions were helpful. Students expressed gratitude for the methodology and the reinforcement, and they perceived the environment as “supportive and nurturing”. So, the weekly quizzes were seen as providing benefit. I, as the professor, was seen as a helper for their learning. I was not viewed as giving hard tests that were punitive in nature, which some students perceive with larger mid-term exams.

In the end, although the actual mean of the quizzes on the surface were not as impressive as I had hoped, I do know students learned and found value in this method and in my teaching style. To account for the drop off in grades and learning at the end of the semester with the final, my plan moving forward is to use short activities during last portion of the class to reinforce and retrieve the new material. For example, I will have students write practice questions, and I will also have them apply new material with short problems sessions. Overall, this repeated quiz technique throughout the semester is something worth trying again and repeating next year (post COVID). At this time, I hope students will not be as stressed, interacting with me in a physical brick-and-mortar classroom, where we can have even more synergy, engagement and, the best of all, learning as a result.

## References

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