

Oral reviews in mathematics

Educator: J. McLean Slougher, Jim Humphreys and Dylan Helliwell, Faculty of Mathematics

Context: Out of class; Calculus Sequence

Keywords: conceptual difficulties, test preparation

Student Activity Time: 1 hour

Prior to the regularly scheduled course exam, students volunteered to participate in an oral review of the course material.

Introducing the Reflection Activity

Success in the calculus sequence is understood to be vital to student retention and overall academic success in engineering. In the calculus sequence at Seattle University, a team of educators facilitates oral reviews in preparation for course exams. The oral reviews, co-facilitated by faculty and advanced undergraduates (called Learning Assistants), provide an opportunity for calculus students to reflect on the difficult concepts in the unit and prepare for the upcoming exam. The purpose of this activity is to assist students in reflecting on conceptual difficulties in their calculus course in service of preparing for the upcoming exam.

Throughout the term, students enrolled in calculus courses were supported by upper level undergraduate students who served as Learning Assistants. Learning Assistants facilitated weekly review sessions for calculus students to attend on a voluntary basis. Within two weeks of the regularly scheduled course exam, educators notified students of the opportunity to sign up for the oral examination study session. A maximum of 5 students signed up for each of the out of class oral exam sessions.

Faculty members selected problems that required clear conceptual understanding of the topics that would be included on the exam. Then faculty members and Learning Assistants acted as facilitators for the oral examination session. Each student was given a designated white board space to work the problem assigned and the faculty member verbalized the question for students to work on. Each participating student then transcribed their understanding of the question and solved to the problem to the best of their ability. Students were allowed to talk to each other and collaborate while the Learning Assistants and faculty members only participated to steer students to the correct next step to solve the problem.

As a result of participating in the oral examination, students were able to identify areas of strength and weakness in their final preparation for the next exam. Many students were able to organize the material in a conceptually sound manner that would support their success on the next exam.

Recreating the Reflection Activity

Description	
1	Schedule and extend the offer to students to participate in the oral exam.
2	Identify questions that require students to demonstrate conceptual knowledge of the topic.
3	Facilitate oral review session.
4	Repeat the activity throughout the term.

In the words of the Educator: Tips and Inspiration

Select problems that present conceptual difficulties. Questions that are given at the oral examination get at the conceptual understanding of the topics that will be on the exam. Instead of just asking them to calculate something, there will be questions about why students were solving the problem a certain way or use a specific approach. It's interesting when two students use a different approach and still get the right answer because then you can ask them to explain why different methods work. We also ask questions about what would change if a couple components of the question changed. The goal is to support students' conceptual and intuitive understanding of the material. If that conceptual understanding is solid, solving the more calculations-based questions on the actual test will be easier because they have a more thorough understanding of what they are doing and why.

Train the Learning Assistants well and examine the positive effects the program has on them. The quality and confidence of the Learning Assistants impacts the students that are participating and it impacts them as students as well. In training, we do practice oral reviews, and we demonstrate the types of challenges that students encounter in the calculus courses. It was striking to me the affect the oral reviews had on the Learning Assistants. Our learning assistants help with the oral review and also facilitate weekly study sessions for these classes. They are consciously thinking about their own learning processes and those of the students they are working with.

What was the inspiration for the reflection activity? The idea was developed by Mary Nelson's work "Oral assessments: Improving retention, grades, and understanding."¹ We wanted to reduce the number of students who were failing math courses or those who were passing, but only barely. Essentially, we wanted to focus on retention. From some research, we know that poor performance in first year courses negatively affects retention in STEM majors, so we wanted to address that issue.² Most of the Learning Assistants have been engineering majors, so one of the side benefits of the program is the benefit to the Learning Assistants themselves. Their confidence in math improves along the way as well.

References:

1. Nelson, M. A. (2010). Oral assessments: Improving retention, grades, and understanding. *PRIMUS*, 21(1), 47-61.
2. J.D. Carter, D. Helliwell, A. Henrich, M. Principe, and J. M. Sloughter, Improving student success in calculus at Seattle University, to appear, *PRIMUS*