

Activity

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Reflecting in Pre-Reading Quizzes

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Context: Out of class, Introduction to Nuclear Engineering

Keywords: quizzes, reading, connecting learning, misconceptions

Student Activity Time: 10-15 minutes

As part of a pre-reading quiz, first-year students wrote descriptions of problem solutions.

Introducing the Reflection Activity

In a first-year course on nuclear engineering, students engaged in weekly or bi-weekly pre-reading quizzes as part of the assigned readings. An important part of these quizzes was the reflection question(s) in the form of “problem solution descriptions.” The purpose of the reflection question was to support students in thinking back on their understanding of the problem solving process using the relationships among variables for example problems contained in the reading.

At the beginning of the semester, the educator introduced the pre-reading quizzes and the associated reflection question(s). In the reflection questions, students were expected to write a short individual reflection (6 or 7 sentences) that described the mathematical process or the engineering content that they needed to solve the problem by responding to the prompt: describe the steps to solve this problem. After students submitted the reflections, the educator graded the reflection using a 2.0-point scale. To earn full points, students needed a complete, well-described response that mentioned topics such as equations needed and necessary assumptions. The grading wasn’t focused on students obtaining a “correct” numerical answer for the problem, but rather if the description included all the necessary components to get to the answer. This process provided the educator with valuable information about misconceptions in intermediate steps. Students received partial credit if they only got partway through the process, used only numbers to solve the problem rather than explanations, or gave vague responses. Based on what the educator saw in the reflections he adjusted his teaching approach. For example, if a lot of students were missing some of the steps, he addressed this topic in class.

In terms of outcomes, these types of reflection questions on the quiz have the potential to help the students understand the problem solving process not as a repetition of the example from the book, but as a generalization of concepts that work together in certain ways to do engineering work.

Recreating the Reflection Activity

	Description
1	Introduce the pre-reading quiz to students.
2	Grade the pre-reading quizzes using a 2.0 scale.
3	Address topics in class based on pre-reading quiz responses.

In the words of the Educator: Tips and Tricks

Be prepared for multiple approaches to a solution. I was often surprised by the number of different paths to solutions that the students took. I, of course, had my already learned solution paths that seemed obvious to me as the simplest way to get to the answer. But there was more than one alternative solution form, including creative new ideas from students.

Grading takes more time. It takes more time to grade these reflections compared to the auto-grading options available online for multiple-choice questions. So, there is a trade-off there with the additional information I was obtaining about students' learning.

Use a variety of tools for grading. This was an online quiz where students were typing in text, so I was able to export it into Excel with each student response on their own row. So, I would actually type comments about the student's reflective process descriptions in a new column next to their response. Then I would import that into my grade book, which I could post back into a tool in my learning management system where the students could see my comments from their own line in my grade book. That can be a big time-saver.

Have clear prompts. It is important to note that you have to practice the prompts to get what you want out of the students. You can expect to fail on a semi regular basis and not quite get the response quality you want. For example, sometimes my prompts did not tell students at what level I wanted them to think about things and they just took a surface approach to get the reflection done. Or, if you put in too much detail, you can sidetrack the students or end up giving away a misconception or other issue you were looking to uncover.

What was the inspiration for the reflection activity? This reflection prompt, which is embedded in the reading quiz, came about because I started out doing reading quizzes that were very factual. What I quickly learned after doing that a couple of times in a row was that the students were not actually thinking about the chapter they were reading about. They were just looking at the answer by paging through and matching the multiple-choice question until they found the paragraph I took the question from. So, I wanted to do something that would actually make them think and read the material in a little different way before they came to class with critical issues, rather than just matching what I wanted.