

Process as a Path to Solutions

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Context: In-class; Statics

Keywords: teams, class reflection, problem solving

Student Activity Time: 50 minute class period

Students reflect on the course material and engage in designing a set of steps to solve problems as a team.

Introducing the Reflection Activity

Learning and knowing the steps for solving a problem is the most important skill for students to develop in their foundational engineering courses, as common problem solving steps will help them solve more complicated problems in the future. In order to assist students in consistently applying problem solving steps, each group was to convene and discuss their process for solving a particular problem. From there, each group was required to come to a consensus on the best process to solve similar problems and then use that process to solve a new problem. This activity had two purposes: first, to support students' sense-making of complex problems in statics and second, to prepare them to solve more complex problems in the future.

In this class session, the educator introduced the assignment "Reflection of Format Usefulness" and explained the activity objective of developing a process to solve multiple, yet similar problems in statics. The educator divided students into groups and prompted each group to discuss one problem from the homework assignment. Each group then shared their process for solving the problem and developed a list of steps (only in words, not mathematical expressions) as a group for completing any similar problem. The educator then gave each group a new problem to solve using the process that each group outlined for themselves. After each group finished the second problem, the educator facilitated a class discussion on the steps necessary for successful engineering problem solving. The educator also asked students to consider what process they use to solve homework problems and how consistent they are in its application.

As a result of this activity, students better understood the conceptual features of the statics course and were prepared to solve complex problems independently using a consistent process. For some students, this activity resulted in more constructive homework time, while for others the activity helped students to perform better on course exams.

Recreating the Reflection Activity

Description	
1	Separate students into groups of 3-5 and assign problems for groups to develop a list of steps to get to a solution.
2	Exchange solution steps among the groups in class.
3	Ask each group to only use the steps given to arrive at a solution on the whiteboard.
4	Provide each group a short period of time to present their solution to the class.
5	Ask each group to revise the directions that they received.
6	Discuss requirements for a problem solving plan for statics.

In the words of the Educator: Tips and Inspiration

Carefully select problems. You don't want to give the students simple questions for this task. At least medium challenge or difficult frame and machine problems work best for this kind of activity.

Focus on the process. Students want to solve the problem right off. Reminding students about the purpose of the activity, which is to define the steps of solving the problem, helps a lot. It re-emphasizes that the steps they take to solve a problem are just as important as the solution. It also helps them adjust their thinking about what is most important – the answer is only as useful as the process they used to find it.

What was the inspiration for the reflection activity? I had the suspicion that a large proportion of the students were using the solution manual to do their homework. In general, they were only focused on the answer and not the process and that was evident in their homework and tests. I wanted them to understand that the answer wasn't the jewel—understanding the process was the jewel and the purpose of them taking this class.