Video Link and Info for Principle 3: Confronting Pitfalls

Contrasting mathematical reasoning with and without pitfalls builds conceptual understanding and prompts students to self-monitor and self-correct.

https://vimeopro.com/wested/math-pathways-and-pitfalls-principle-3

Have You Wondered?

Why do students make some of the same errors on math problems time and time again even though I often introduce the concept in different ways? It is because these errors, or pitfalls, are common and stubborn misconceptions that students have. To help students avoid making these errors, there are a variety of instructional practices that you can use.

Using the Principle With *Math Pathways & Pitfalls*

In these video clips, you will see how a 3rd grade teacher applies the Confronting Pitfalls principle in her classroom. In *Math Pathways & Pitfalls*, students are introduced to a starter problem and given reasoning for a correct solution process, as well as reasoning with a common pitfall. The *Math Pathways & Pitfalls* lesson depicts two fictional students, one of whom provides reasoning for the correct solution while the other gives reasoning for a proposed solution with a pitfall.

In the video clips, Ms. Richards is conducting a discussion about two fictional students' reasoning with her 3rd graders. The class is discussing a problem from the lesson called "A Little Less."

Teaching Practice 1: Have students solve problems that have a common pitfall.

To prepare for the *Math Pathways & Pitfalls* lesson, Ms. Richards studied the lesson's teaching manual and student pages. She paid particular attention to the discussion prompts for the "OK" solution and the "Oops" proposed solution with a pitfall. Ms. Richards described her planning for the lesson as follows:

> I anticipated and wrote down solutions that I thought students would generate, including the OK and Pitfall solutions of the fictitious students already given on the lesson page. I focused on solutions that would be fertile ground for accomplishing the learning goals of the lesson.
>
> I also wrote down questions I could ask to elicit ideas and solutions that were critical to the lesson goals but ones that students might not come up with on their own.

In the first video clip, Ms. Richards asks students to solve the starter problem on their own:

> What is 5 less than 402?

She lets them know they can keep their solutions private. While students solve the problem, she walks around the room jotting notes. She tells students that it is common to have pitfalls with this type of math problem and identifies a common pitfall for this particular problem.

Teaching Practice 2: Ask students to use mathematical reasoning to explain and justify why a solution is correct.

In this video clip, Ms. Richards introduces Nan, a fictional student in the lesson who has a correct (or OK) solution for the starter problem that the class just worked on. Nan uses a number line to count back to 400, then to 397; then Nan concludes that if she had subtracted, she would have gotten the same answer. Ms. Richards instructs

students to read each part of Nan's solution and analyze her drawing. After students discuss in pairs, she conducts a whole-class discussion pushing students to use reasoning to figure out why Nan's solution is correct and makes sense.

Teaching Practice 3: Ask students to use mathematical reasoning to explain why a proposed solution with a pitfall doesn't make sense.

In this video clip, Ms. Richards introduces the reasoning of Victor, the second fictional student in the *Math Pathways & Pitfalls* lesson. Victor proposes a solution based on a pitfall in subtraction. He suggests that the difference is 403 after subtracting 5 from 402. Ms. Richards asks students to explain why Victor's solution does not make sense.

Using the Principle With District-Adopted Materials

Ms. Arrillaga is a 2nd grade bilingual teacher. She chose a lesson about equality because she knew her students had misconceptions in this area. She has adapted the Confronting Pitfalls principle and the three related teaching practices to a district-adopted lesson. You will notice some slight variations in the way the problem is posed and how the practices are applied.

Teaching Practice 1: Have students solve problems that have a common pitfall.

To prepare for the lesson, Ms. Arrillaga chose a problem from her district-adopted text. She knew students might have trouble with it because they had misconceptions about the concept.
She chose the following equation as the starter problem for the lesson:

17 + 28 = __ + 17

Teaching Practice 2: Ask students to use mathematical reasoning to explain and justify why a solution is correct.

In this video clip, Ms. Arrillaga asks students to talk to their partners about why the OK solution is correct and why the pitfall solution is incorrect.

Teaching Practice 3: Ask students to use mathematical reasoning to explain why a proposed solution with a pitfall doesn't make sense.

In this video clip, Ms. Arrillaga asks her students to talk about the pitfall. She states that many of them wrote 45 in the blank. Ms. Arrillaga has them talk in pairs about why they did that and why the answer doesn't make sense.