

Standards Analysis

Problem solving is an essential skill for schools to develop in order to prepare students for the workforce. Most jobs require critical thinking and creativity, which are embedded in the following science standards.

The first standard I reviewed was 5-ESS3: Earth and Human Activity. In this standard, students are asked to understand information about the Earth and its communities, then generate ideas to help protect its resources. This type of work often connects to the ill-structured model described by Kirkley and Jonassen, because students are asked to tackle broad, open-ended problems such as designing sustainable energy resources. While this promotes authentic problem solving, the openness can be overwhelming. Students may give up if they are not guided through the process, which reflects Jonassen's point that too often design practices are overshadowed by memorization. As a result, students may not be fully prepared for the ill-structured problems they will face in the workforce.

The next standard I explored was 3-5-ETS1: Engineering Design. Here, students are required to engineer simple design problems, plan and carry out tests, and generate multiple possible solutions. This standard directly emphasizes problem solving and design thinking. However, I noticed that in many of my units, 3-5-ETS1 appeared only once or twice as a single lesson, rather than being integrated throughout the unit. This lack of consistent exposure means students rarely see problem solving as an everyday skill, limiting their ability to transfer it beyond the classroom.

The final standard I looked at was 5-PS2: Motion and Stability—Forces and Interactions. Students working with this standard must explore concepts such as gravitational pull and Earth's rotation. This type of problem solving is often more structured, since there is one primary explanation, but it still engages students in developing models, testing ideas, and connecting science to real-world experiences. I found that this standard appeared in only a couple of my units, yet it has strong potential for engaging student curiosity through hands-on exploration.

The standards share several important similarities. All three emphasize problem solving as more than rote memorization, requiring students to reason, test, and apply their knowledge. They also connect learning to real-world applications, whether through sustainability in 5-ESS3, engineering practices in 3-5-ETS1, or natural phenomena such as gravity in 5-PS2. In addition, each of the standards provides opportunities for design, modeling, or project-based learning, giving students the chance to create something new and innovative.

Despite these similarities, there are also clear differences across the standards. The type of problem solving varies significantly, with 5-ESS3 often relying on ill-structured, open-ended problems, 3-5-ETS1 focusing on structured design processes, and 5-PS2 blending exploration with more guided scientific inquiry. The level of complexity also differs, as engineering new ideas in 3-5-ETS1 and 5-ESS3 can be far more challenging than investigating gravitational forces in 5-PS2, which generally has clearer solutions. Another difference lies in

their integration into units. 3-5-ETS1 tends to be underused, appearing only in isolated lessons, while 5-PS2 shows up occasionally, and 5-ESS3 often risks being reduced to memorization if not carefully designed.

Looking at these standards through Jonassen's lens reinforces the need for more varied and sustained problem-solving opportunities within units. Too often, tasks are simplified so students can succeed quickly, but this reduces the complexity they will encounter outside of school. If we want students to be ready for the workforce, they must practice solving problems of different structures and difficulties, work collaboratively, and persevere through challenges. Problem solving should not be a one-time activity at the end of a unit but should be embedded throughout instruction so students see it as a natural part of learning and life.