

Real-World Problem-Solving and Innovation

Does the learning activity require solving authentic, real-world problems? Are students' solutions implemented in the real world?

Overview

In today's workplace, problem-solving tasks abound. Whether the need is to find new ways to reach global markets or to redesign a product to take advantage of new materials, successful workers must be adept at generating and testing creative ideas in order to solve a problem with a real set of requirements and constraints. This is a very different definition of "problem" than we often see in academic settings, where textbook "problems" are simply practice at executing specific learned procedures.

This rubric examines whether students' work involves **problem-solving**, and uses data or situations from the **real world**. The strongest learning activities for this rubric:

- ask students to complete tasks for which they **do NOT already know** a response or solution
- require students to work on **solving real problems**
- represent **innovation** by requiring students to implement their ideas, designs or solutions for audiences outside the classroom.

Big Ideas

Problem-solving involves a task with a defined challenge for the student. Problem-solving happens when students must:

- develop a solution to a problem that is new to them OR
- complete a task that they have not been instructed how to do OR
- design a complex product that meets a set of requirements.

Learning activities that require problem-solving do NOT give students all the information they need to complete the task or specify the whole procedure they must follow to arrive at a solution.

Often, problem-solving tasks require students do some or all of the following:

- investigate the parameters of the problem to guide their approach
- generate ideas and alternatives
- devise their own approach, or explore several possible procedures that might be appropriate to the situation
- design a coherent solution
- test the solution and iterate on improvements to satisfy the requirements of the problem.

To count for this rubric, problem-solving must be the learning activity's **main requirement**.

IS THIS PROBLEM-SOLVING?	
YES:	NO:
<p>Students must rewrite a story from the perspective of a character other than the narrator. Students use the original story but have not been instructed how to complete this task.</p>	<p>Students read a story and then take a quiz about what they read. Students do not have to develop any solutions. There is no defined challenge for the students.</p>
<p>Students use a map of a bus route to propose where pedestrian crossings should be added in a fictional town. Students have not been instructed where to put the crossings.</p>	<p>Students learn about pedestrian safety by studying a map showing bus stops and pedestrian crossings. There is no defined challenge for the students.</p>
<p>Students identify appropriate situations for using mean, median and mode by exploring several sample datasets in Microsoft Excel. Students have not been instructed on how each measure is best used.</p>	<p>Students use Microsoft Excel to calculate the mean, median and mode of several sample datasets. Students are simply practicing a computation.</p>

Real-world problems are authentic situations and needs that exist outside an academic context. Real-world problems have **all** of the following characteristics:

- Are **experienced by real people**. For example, if students are asked to diagnose an ecological imbalance in a rainforest in Costa Rica, they are working with a situation that affects the real people who live there.

- Have solutions for a **specific, plausible audience** other than the educator as grader. For example, designing equipment to fit a small city playground could benefit the children of the community.
- Have **specific, explicit contexts**. For example, developing a plan for a community garden in a public park in their town has a specific context; learning which vegetables grow best in which parts of one's country does not.
- If students are using data to solve a problem, they **use actual data** (for example, real scientific records of earthquakes, results of their own experiments, or first-person accounts of an historical event), not data developed by an educator or publisher for a lesson.

ARE THESE REAL-WORLD PROBLEMS?	
YES:	NO:
Students rewrite a Shakespeare play for a teenage audience. Teenagers are a real, specific audience.	Students rewrite a Shakespeare play in a new rhyme scheme. This has no specific audience.
Students use their town's bus map to propose where pedestrian crossings should be added in their town. This has a specific, explicit context. Students use actual data to do this.	Students use a bus map in a textbook to propose where pedestrian crossings should be added in a fictional town. This does not involve actual data.
Students investigate whether growing plants in their classroom can improve the air quality. Even though the setting is the classroom, air quality is a real issue.	Students investigate the interaction between green plants and carbon dioxide in the air. There is no explicit context for the students' investigation.
Students analyze data about the basketball team and use Microsoft Excel to graph performance patterns for the overall team and individual players. Students are using actual data about the team and performing analysis typically conducted by the coaching staff.	Students identify appropriate situations for using mean, median and mode by exploring several sample datasets in Microsoft Excel. Students are using datasets created by the educator.

Innovation requires **putting students' ideas or solutions into practice in the real world.**

For example, it IS innovation if students design *and build* a community garden on the grounds of their school; just designing the garden is NOT innovation.

In cases where students do not have the authority to implement their own ideas, it is innovation ONLY if students convey their ideas to people outside the classroom context who *can* implement them. For example, it IS innovation if students present their ideas for building

a community garden in a public park in their town to a local environmental group or to local officials, but NOT if students design a community garden for that public park and only share their plans with their teacher and classmates.

Innovation also **benefits people other than the student**; it has value beyond meeting the requirements of a classroom exercise. The townspeople who tend the new garden in the public park and the teenagers who attend the rewritten Shakespeare play benefit from students' efforts, for example.

It also counts as innovation if students create a project for a science fair or submit an original poem to a regional poetry contest, for example, because the fair and contest are not educator-controlled and have real audiences who are interested in and may benefit from the students' work.

IS THIS INNOVATION?	
YES:	NO:
<p>Students rewrite a Shakespeare play for a teenage audience and perform it at a local youth center. The teenage audience at the youth center benefits from the students' effort.</p>	<p>Students rewrite a Shakespeare play for a teenage audience but do not perform it. No one outside the classroom benefits from the students' effort.</p>
<p>Students write letters to the town council about their ideas for adding pedestrian crossings in their town AND mail the letters to council members. Students cannot make new pedestrian crossings themselves but the town council can implement their ideas.</p>	<p>Students write letters addressed to the town council about improving pedestrian safety BUT only give the letters to their educator to grade. The letters did not reach an audience beyond the educator as grader.</p>
<p>Students investigate 2 or more online websites or games, develop a presentation using Community Clips and Windows Live Moviemaker about internet safety guidelines for parents and students to be aware of, AND present their products at parent's night. Parents and students who attend the parent's night presentation are an authentic audience for the guidelines that students developed.</p>	<p>Students investigate 2 or more online websites or games, and develop a presentation using Community Clips and Windows Live Moviemaker about internet safety guidelines for parents and students to be aware of. Their product is handed in for a grade. Students learned about internet safety but did not communicate their solutions to others who needed this information.</p>

Students analyze statistics on the basketball team's past performance and create mathematical models using Microsoft Excel for the coach to illustrate targeted improvements for both team and individual performance. The coach can use students' analysis to help players focus their training on skills that need improvement.

Students analyze data about the basketball team and use Microsoft Excel to graph performance patterns for the overall team and individual players.

Students' graphs are presented to the class as an academic exercise.

Real-World Problem-Solving and Innovation: Rubric

- 1**
 - The learning activity's main requirement IS NOT **problem-solving**. Students use a previously learned answer or procedure for most of the work.
- 2**
 - The learning activity's main requirement IS **problem-solving**
 - BUT the problem IS NOT a **real-world problem**.
- 3**
 - The learning activity's main requirement IS **problem-solving**
 - AND the problem IS a **real-world problem**
 - BUT students DO NOT **innovate**. They are NOT required to implement their ideas in the real world, or to communicate their ideas to someone outside the academic context who can implement them.
- 4**
 - The learning activity's main requirement IS **problem-solving**
 - AND the problem IS a **real-world problem**
 - AND students DO **innovate**. They ARE required to implement their ideas in the real world, or to communicate their ideas to someone outside the academic context who can implement them.

Real-World Problem-Solving and Innovation: Decision Steps

