Cross-Content Recommendations and Strategies

Aligned with South Carolina Standards

Organizing Instruction and Study to Improve Student Learning

Grades K–12th

Recommendation 2

Interleave worked example solutions and independent problem-solving exercises.

This document provides a summary of recommendations from the WWC practice guide *Organizing Instruction and Study to Improve Student Learning.*

Recommendation 2

Interleave worked example solutions and independent problem-solving exercises.

When teaching problem-solving, teachers can interleave worked example solutions and problem-solving exercises—literally alternating between worked examples demonstrating one possible solution path and problems that the student is asked to solve. Research has shown that this interleaving markedly enhances student learning.

Strategy 1

Revisit, re-practice, and reinforce classroom behavioral expectations.

South Carolina standards alignment

SC Teaching Standards: INST.T.1.1-4, INST.PS.1-9
SCDE School Climate Survey: ELA.K-12.I.3, M.K-12.MPS.PS.1, SCI.K-12.S.1

Students learn more by alternating between studying examples of worked-out problem solutions and solving similar problems on their own than they do when just given problems to solve on their own. The amount of guidance and annotation will vary depending on the situation and the student. Consider varying the amount of guidance and support.

Strategy 2

Use partially solved problems to transition to independent problem-solving.

South Carolina standards alignment

SC Teaching Standards: INST.T.1.1-4, INST.PS.1-9
Academic Standards: ELA.K-12.I.3, M.K-12.MPS.PS.1, SCI.K-12.S.1

As students develop greater expertise, decrease the use of examples and increase independent problem-solving. Try using partially solved problems by giving early steps in a problem and requiring students to provide more and more of the later steps as they acquire more expertise with the problem type.

Subject

- Math
- ELA
- **Cross Content**
- Behavior

Level of Evidence

- Minimal
- **Moderate**
- Strong

Grades

- **Pre-K**
- **K**
- **1st**
- **2nd**
- **3rd**
- **4th**
- **5th**
- **6th**
- **7th**
- **8th**
- **9th**
- **10th**
- **11th**
- **12th**

Strategy 3

Vary the requirements between worked examples and independent problems.

South Carolina standards alignment

SC Teaching Standards: INST.T.1.1-4, INST.PS.1-9
Academic Standards: ELA.K-12.I.3, M.K-12.MPS.PS.1, SCI.K-12.S.1

As students develop greater expertise, ask students to independently solve problems that vary from the worked example (e.g., changing both the values included in the problem and the problem formats).

Potential Roadblock 1

Curricular materials do not often provide teachers with large numbers of worked example solutions.

Suggested Approach. Teachers can work together on teams to prepare homework sets that interleave worked examples with problems for students to solve. Teachers can take worked examples included in the instructional section of the textbook and interleave them into the assigned homework problem sets.

Potential Roadblock 2

Teachers may be concerned that by providing large numbers of worked-out examples to students, they will memorize the solution sequences and not attain mastery of the underlying concepts being taught and reinforced through this interleaving technique.

Suggested Approach. By having problems to solve in between the worked examples, students are motivated to pay more attention to the worked example because it helps them prepare for the next problem and/or resolve a question from the past problem. Having problems to solve helps students recognize what they do not understand. Students are notoriously poor at identifying what they do not understand (see Recommendation 6 for a discussion of learners' "illusion of knowing"). By interleaving worked examples with problems to solve, students are less inclined to skim the example because they believe that the answer is obvious or they already know how to solve this type of problem.

References

Pashler, H., Bain, P., Bottge, B., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007.) *Organizing Instruction and Study to Improve Student Learning* (NCER 2007-2004). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/WWC/PracticeGuide/1