Intervention Name:
Interleaved solutions and problem solving

Common Core State Standards Domain Areas: (check all that apply)

Counting and Cardinality (K)	Operations and Algebraic Thinking (K-5)	Numbers and Operations in Base Ten (K-5)	Numbers and Operations – Fractions (3-5)	Measurement and Data (K-5)	Geometry (K-HS)	Ratios and Proportional Relationships (6-7)	The Number System (6-8)	Expressions and Equations (6-8)	Statistics and Probability (6-HS)	Functions (8-HS)	Number and Quantity (HS)	Algebra (HS)	Modeling (HS)
X	X	X	X	X	X	X	X	X	X	X	X	X	X

Setting: (check all that apply)		
Whole-class	Small-group	Individual
X	X	X

Focus Area: (check all that apply)		
Acquisition	Fluency	Generalization
X	X	X

Function of Intervention: The purpose of interleaving worked problems and problems to solve is to provide scaffolding through models or examples for students as they proceed through a set of math problems.

Brief Description: As teachers provide lists of problems to students that need to be solved, they alternate problems to be solved with examples that already demonstrate the solutions (i.e., worked problems). Initially every other problem is a worked problem (see example), but as students proceed through the problem set, the ratio of problems to solved and worked problems changes. Gradually, a teacher can scaffold the interleaving of the worked problems by reducing the number of worked problems. This interleaving technique can be used with any content. It can be utilized with a large group by introducing a worked problem and then having small groups or individual students solve a similar problem on their own. It could be used in small groups by having students discuss a worked example and then have each individual student solve a problem on their own. It could be used with individual students when assigning independent work or homework.

Example (taken from the IES practice guide on Organizing Instruction and Study to Improve Student Learning):
When given some algebra problems to solve, the even-numbered items would be usual problems, like the following algebra problem:

1. Solve $5 + 3x = 20$ for x

The odd numbered problems would come with solutions, like this:

Below is an example solution to the problem:
2. Solve $12 + 2x = 15$ for x
Study each step in this solution, so that you can better solve the next problem on your own:
$12 + 2x = 15$
$2x = 15-12$
$2x = 3$
$x = 3/2$
$x = 1.5$

The lessons can be any length and can be used with content from whatever area the teacher is currently presenting problems.

Procedures:

- **Duration:** Interleaved problems and worked solutions can be any number of math problems.

Brief developed by Erica Lembke, University of Missouri

- **Teacher training:** Teachers should develop sample solutions to problems prior to the lesson or assignment.
- **Instructional practices:** Teachers can work with students to introduce the worked examples in large or small groups or the examples can be provided on the assignment that is provided to students. More detail can be provided about the steps in how the example was solved or the problem steps can simply be listed with little detail.
- **Monitoring system:** The scoring system that the teacher uses for the assignment is kept intact.

Critical Components (i.e., that must be implemented for intervention to be successful): Teachers must provide *correctly* worked examples along with problems to be solved. The number of correctly worked problems can gradually be reduced to promote greater student ownership.

Critical Assumptions (i.e., with respect to prerequisite skills): Enough problems have to be provided so that some can be worked out as examples and others can be provided for student problem solving. Teachers may have to develop additional problems.

Materials: Teacher developed

References:

McLaren, B. M., Lim, S., & Koedinger, K. R. (2008). When and how often should worked examples be given to students? New results and a summary of the current state of research. In B. C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society* (pp. 2176-2181). Austin, TX: Cognitive Science Society.

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, D.C.: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ncer.ed.gov.