This document provides a summary of Recommendation 4 from the WWC practice guide *Organizing Instruction and Study to Improve Student Learning*. Full reference is on the last page.

CONTENT **General**

GRADE LEVEL(S) **K-12**

LEVEL OF EVIDENCE **Moderate**

Recommendation

Connect and integrate abstract and concrete representations of concepts.

Teachers can connect and integrate abstract representations of a concept with concrete representations of the same concept. Connecting different forms of representations helps students master the concept being taught and improves the likelihood that students will use it appropriately across a range of different contexts. Research suggests that introducing and using only abstract or concrete representations of concepts inhibits students from applying the knowledge in new and unique circumstances. Rather, teachers could start with concrete representations to reinforce initial learning, and then fade into more abstract representations to encourage more flexible knowledge use.

How to carry out the recommendation

1. Connect abstract ideas to relevant concrete representations and situations.

South Carolina standards alignment

TEACHERS: INST.PIC.1, INST.PIC.2
ACADEMIC STANDARDS: ELA.K-12.I.3, ELA.K-12.I.4, M.K-12.MPS.AJ.1, SCI.K-12.S.1.2

When presenting an abstract idea to students, highlight the relevant features across all forms of the idea. An abstract idea can be expressed in many ways. By showing students the same idea in different forms, teachers can demonstrate that although

the "surface" form may vary, it is the "deep" structure—what does not change—that is the essence of the idea.

2. Use a variety of representations and explicitly discuss the connections between them.

South Carolina standards alignment

TEACHERS: INST.PIC.1, INST.PIC.2
ACADEMIC STANDARDS ELA.K-12.I.3, ELA.K-12.I.4, M.K-12.MPS.AJ.1, SCI.K-12.S.1.2

When students first encounter a new idea, they may pick up on the wrong features of the examples. For example, they might think that averages are about sports if only sports examples are used. They may also develop misconceptions about the concept, for example, that an average is a ratio between two numbers (e.g., hits to at-bats) rather than a ratio of a sum of measures to the number of those measures (e.g., (2 + 6 + 4)/3). Teachers should use a variety of representations and explicitly discuss the connections between them to help students avoid such misconceptions.

3. Apply new knowledge across multiple examples that vary in their relative concreteness or abstractness.

South Carolina standards alignment

TEACHERS: INST.PIC.1, INST.PIC.2
ACADEMIC STANDARDS ELA.K-12.I.3, ELA.K-12.I.4, M.K-12.MPS.AJ.1, SCI.K-12.S.1.2

Help students to acquire a more flexible understanding of the key concepts by providing multiple examples that vary in their relative concreteness or abstractness. Moving students quickly through memorizing new terms and symbols only allows students to use the knowledge in limited contexts.

4. Connect or "anchor" new ideas in stories or problem scenarios that are interesting and familiar to students.

South Carolina standards alignment

TEACHERS: INST.PIC.1, INST.PIC.2, INST.TCK.3
ACADEMIC STANDARDS ELA.K-12.I.3, ELA.K-12.I.4, M.K-12.MPS.AJ.1, SCI.K-12.S.1.2

Connect and integrate abstract and concrete representations of concepts.

Introduce students to new ideas or concepts by anchoring them in stories or problem scenarios that are familiar to the student. Then, use a variety of successively more abstract representations of the new idea to support the student in developing conceptions that get beyond the surface features of those early examples and get to the deep features and core concepts that are the essence of the idea.

Potential roadblocks and how to address them

Roadblock	Suggested Approach
Explicit connections between abstract concepts and their concrete representations are not always made in textbooks, nor in instructional materials prepared to support teachers.	When preparing examples and instructional materials, textbook publishers and teachers should clearly identify which aspects of an abstract representation and its concrete instantiation are connected. We believe that having these relationships clearly identified ahead of time can support the use of this recommended technique during instruction.

For more information on the research evidence and references to support this recommendation, please refer to sources cited here:

Pashler, H., Bain, P., Bottge, B., Graesser, A., Koedinger, K., McDaniel, M., and 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. Retrieved from http://ncer.ed.gov.