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CORE Reading Expert

Journal Article Review: Helping ELLs Meet the Common Core State Standards for Literacy in Science

by Dale Webster, Ph.D., CORE Chief Academic Officer

Research by Diane August and colleagues to help English learners (ELs) meet the Common Core State Standards (CCSS) for literacy in science was recently published in the Winter 2014 edition of the *Journal of Research on Educational Effectiveness*. The goal of this study was to build on the limited experimental research focusing on developing academic language in science for *both* EL and English proficient (EP) students.

Two research questions guided this study. The first question examined the extent to which teachers' instruction changed by implementing the researcher-designed intervention, Quality English and Science Teaching 2 (QuEST 2). The second question examined the extent to which QuEST 2 was effective in developing students' academic language in science. An overriding principle of the study was that an intervention must be effective for both EL and EP students because both are frequently grouped together in the same classrooms.

The study was implemented in ten middle schools located in a high-poverty district of the Rio Grande Valley in Texas with a high percentage of Latino EL students. Participants in the study were 1,309 sixth grade students with 27% of them being classified as English learners. Fifteen teachers who were qualified to teach science participated with each of their two classes randomly assigned to be control classrooms and two of their classes randomly assigned to be treatment classrooms. Control classrooms used the Prentice Hall textbook and workbook along with district-developed labs that were aligned with textbook content. The treatment classrooms used those same materials and also used a researcher-designed curriculum that consisted of inquiry-based science lessons that incorporated demonstrations and modeling of science content, student academic discussions centered on the science content, and scaffolding techniques such as graphic organizers and close, guided readings of the textbook. In the treatment classrooms, EL students were partnered with EP students.

Teachers received five days of ongoing face-to-face professional development as well as biweekly coaching by a science mentor teacher. Teachers were observed by trained observers to assess fidelity to both the treatment curriculum and instruction, as well as assessing the level of contamination of the treatment instruction in control classrooms.

Despite the efforts to support the implementation, researchers calculated the implementation of the treatment curriculum at 66%, which they considered low. (They speculate that teachers could have benefitted from more training and support in implementation.) Consistent with findings from research that attempts to improve vocabulary and comprehension of disadvantaged students, the effects for academic language and science achievement overall were modest (.21 and .14, respectively). For English learners, the effect was .27 for academic language and zero effect for science achievement. Note that when the data was disaggregated for EL students, the effects for academic language were somewhat larger. This may indicate that EL students were more sensitive to this type of instruction. While these effect sizes are lower than the standard of .40 advocated by Professor John Hattie to judge the viability of interventions (see CORE's Fall 2013 *Academic Quarterly* and John Hattie's book *Visible Learning*), using a complex fidelity analysis, researchers estimate that at 100% implementation the effect sizes for EL students would have been .46 for academic language and .13 for science achievement. The estimated .46 effect size for academic language is encouraging when using Hattie's standard of .40. The low performance in science is attributed to the possibility that EL students were not able to demonstrate the knowledge gained because they may not have been able to fully comprehend the test items. They also acknowledged that the lower-level EL students may need more time and scaffolding to acquire the science knowledge. Taking into consideration the dearth of experimental research on EL students, researchers believe the results are promising.

Three important points can be gleaned from this study:

1. Unlike previous studies involving EL students, teachers were not required to have threshold levels of experience to participate, which makes findings generalizable to a wider range of teachers (p. 79).
2. In light of the rigors of the CCSS, it is important that teachers have high levels of training and support to help students navigate the complicated academic language found in complex text. Teachers also need more training and support in scaffolding instruction and fostering structured academic talk about concepts being learned in all content areas.
3. Teachers will have difficulty navigating the rigors of the CCSS by inventing the curriculum themselves. They need well-developed materials, such as the materials developed for this study, in order to guide them to do their work. Even with well-developed materials, teachers need support in implementing those materials with fidelity. With special populations like English learners, the scaffolded instruction required for students to be successful is the primary intervention.

Reference

August, D., Branum-Martin, L., Cardenas-Hagan, E., Francis, D. J., Powell, J., Moore, S., & Haynes, E. F. (2014). Helping ELLs meet the Common Core State Standards for literacy in science: The impact of an instructional intervention focused on academic language. *Journal of Research on Educational Effectiveness*, 7, 54–82.

Managing Mathematical Discourse: Beyond Question Asking

by Nancy McGivney, CORE Educational Consultant

The Common Core State Standards for Mathematics (CCSSM) require students to “construct viable arguments and critique the reasoning of others” (Standard for Mathematical Practice 3). In order to do this, students must talk and listen to each other—they need to have a real dialogue. However, how many of us have asked students what we thought was a great, thought-provoking question, only to have a sea of blank faces staring back at us? Your students may even have great ideas but lack the experience of putting those thoughts into words.

As many educators have learned, one of the keys to promoting mathematical discourse is asking good questions. Many lists of sample questions are available today on the Internet, and you are encouraged to search out resources for good questions. The following is a set of sentence stems for deeper-level questioning from Marcus and Fey (2003):

- Why . . . ?
- What if . . . ?
- Suppose . . . ?
- What if not . . . ?
- Could it be that . . . ?
- When is it true that . . . ?
- Will . . . always be true? Why?
- How does . . . compare with . . . ?
- What would have to happen to make . . . true?
- If . . . is the answer, then what is the question?

Setting the stage and climate for discussion is important, not only to help all students feel safe to give their ideas even if they are fretful that they may not be correct, but also so that students want to participate. If our goal is to implement the CCSSM Mathematical Practices and to deepen student understanding of math concepts, we need our students to hear and see different perspectives, and to listen, evaluate, and critique the reasonableness of these ideas.

Some prerequisites for setting a climate conducive to discussion are as follows:

- Establish and maintain a respectful, supportive environment.
- Focus talk on math.
- Provide equitable participation.
- Explain expectations and accountability:
    - for speaking (voice volume)
    - for listening (looking at the speaker, heads close for partner sharing, etc.)
    - for behavior protocols (nodding, raising hands, or other indicators of support; asking for clarification; adding on to ideas; disagreeing; etc.)

Any behaviors expected must be taught and practiced before teachers can assume they are solid and no longer need to be reinforced.

Managing Mathematical Discourse: Beyond Question Asking (cont.)

It's probably easiest to begin discussions with some partner response work prior to a whole-group discussion of the problem. That way, each student has time in a small, safe environment to gather his or her ideas and put them into words, and even hear some ideas from his or her partner. Many of our students are reluctant speakers. Thus, having a chance to hear other ideas and an opportunity to rehearse their own words can be beneficial. In addition, provide students with sentence frames as a way to structure the use of complete sentences and academic language. This is particularly important for English learners.

The teacher should set up the partners. Pair students for behavior compatibility and similar loquaciousness. A talker should be paired with someone who also likes to talk; otherwise, the chattier one will dominate the partnership's discussions. However, it is important to pair a shy student with another who may bring out the discussion more.

Another strategy for managing partner and group discussions is to explicitly manage the time for talk. For example, with students working in pairs, tell the pairs that partner A has two minutes to talk, then partner B has two minutes to talk, and then they have two minutes for further discussion with each other. Use a timer and signal to students when each two-minute segment is over. Another excellent add-on to this strategy is after partner A initially shares his or her ideas, partner B begins with a 10–20 second recap of what partner A said. After partner B gives his or her own ideas, partner A must provide a 10–20 second recap of what partner B shared.

Lastly, educators can use and teach students discourse strategies. Some folks call these *talk moves*.

Discourse Strategies

- **Revoicing:** The teacher adds clarity or asks students to clarify or connect ideas expressed. A typical revoicing might begin with "So I heard you say . . ."
- **Restating:** The teacher asks another student to say what the first student said in his or her own words, and then asks the first student if the restatement is correct—for example, "Can you repeat what he/she just said in your own words?" This requires students to listen to each other and make sense of ideas shared.
- **Adding on:** The teacher asks for elaboration, probes with further questions, or just asks if the students agree or disagree and why: "Would someone like to add on?"
- **Wait time:** This is critical in order to engage all students. This gives thinking time before discussion (partner, small group, or whole group) begins. It also gives ample time for processing a question or statement. Wait time can be difficult for many of us; 10–15 seconds can seem like a lot of dead air-time. I actually gaze at the clock in the room if it has a second hand and try to hear the gears moving in my students' minds!

Conclusion

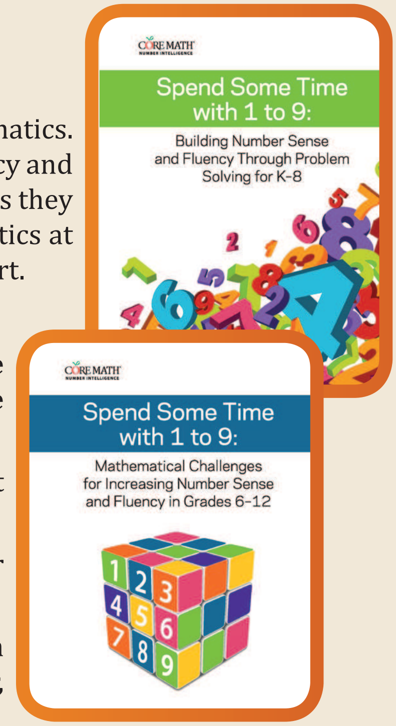
Mathematical discourse is important for meeting the demands of the CCSSM and is critical for deepening student understanding of math concepts. The challenge only begins with good questions—we have to actually get students to respond to the questions. Several techniques, such as talk-time management, creating a classroom atmosphere supportive of fearless sharing of ideas, and so on go a long way toward getting students to engage in mathematical discourse. The main thing is to be sure there are math discussions student to student, not just student to teacher. You can find several good video examples on websites such as www.teachingchannel.org.

Reference

Marcus, R., & Fey, J. T. (2003). Selecting quality tasks for problem-based teaching. In H. L. Schoen and R. I. Charles (Eds), *Teaching mathematics through problem solving: Grades 6–12* (55–68). Reston, VA: National Council of Teachers of Mathematics.

CORE Marvelous Mathematician

Introducing CORE's New Supplemental Math Resource: *Spend Some Time with 1 to 9*



Number sense, fluency, and problem solving are three important aspects of mathematics. *Spend Some Time with 1 to 9* provides teachers with sets of problems that build fluency and number sense while requiring students to think about mathematical relationships. As they work through these problem-solving activities, students reason about the mathematics at the same time as they are constantly putting numbers together and taking them apart.

Features of *Spend Some Time with 1 to 9*:

- **Links to the CCSSM:** The specific content standards from the Common Core State Standards for Mathematics (CCSSM) that connect to each activity are identified and listed.
- **Differentiated instruction:** Activities have built-in multiple entry and exit points that allow for learners of varying levels to access and solve problems.
- **Flexible activities:** Although the activities target specific grade levels or standards, you can use them with other grade levels.
- **Online prep quizzes:** These web-based quizzes lay a foundation for each challenge activity and are available through multiple devices (computer, smartphone, and tablet).

The K–8 edition consists of 25 activities working with whole numbers, rational numbers, and geometric figures. The 6–12 edition (coming soon!) consists of 20 activities that include building fluency with fractions, proportions, algebraic expressions, and geometric concepts. These activities provide additional tools to create a vigorous and engaging mathematics classroom and deepen students' understanding of essential math concepts and number relationships.

With these fun and challenging supplemental math activities, you and your students are sure to enjoy spending time with 1 to 9!

Featured Sample from *Spend Some Time with 1 to 9, K–8*:

1 2 3 4 5 6 7 8 9

Place **any** of the digits from the set above into the numerators in each inequality shown to the right to make the statement true.

You may use a digit more than once in the same statement.

You may only create proper fractions.

a. $\frac{\square}{2} < \frac{\square}{4} < \frac{\square}{8}$

b. $\frac{\square}{4} < \frac{\square}{2} < \frac{\square}{8}$

c. $\frac{\square}{8} < \frac{\square}{4} < \frac{\square}{2}$

Visit www.corelearn.com for more information!

CORE Leadership Corner

Daniel Willingham is a noted cognitive psychologist at the University of Virginia, where his research focuses on the application of cognitive psychology to K–16 education. He has a regular column in the American Federation of Teachers magazine, *American Educator*, and he has written several books on education.

In his blog entry dated January 7, 2014, Willingham reviews the scant research on the relationship between instructional leadership and student performance. He found some surprises but also cautions about the interpretation. In particular, he highlights a "terrific new study" by Grissom, Loeb, and Master (2013) that more clearly illuminates the relationship between instructional leadership and student performance. Methodologically more rigorous than prior studies, researchers followed 100 principals for a full school day, recording what they did, and linked student learning gains, as measured by standardized achievement data, to the observational data.

The results indicated that principals spent an average of 12.6% of their time on activities related to instruction. Surprisingly, the results indicated that time spent on instructional leadership *overall* was **not** associated with student learning outcomes. However, when *specific* instructional leadership activities such as instructional coaching of teachers or time spent evaluating teachers and curriculum were linked to student performance gains, there was a relationship. Also surprising was the negative association between principal walk-throughs and student achievement. However, when researchers followed up, they found differences in student outcomes among schools where teachers viewed walk-throughs negatively and schools where teachers viewed them positively.

The take-home message from CORE is not that school administrators should curtail instructional leadership activities, nor should they curtail walk-throughs or learning walks. Instead, administrators must be more planful for *which* activities they choose and they should attend carefully to *how* they execute those activities, so that walk-throughs are not cursory but instead are deep and connected to feedback. The researchers, along with Willingham, argue that **feedback is essential**: "Instructional leadership activities that offer **meaningful feedback** to teachers may help." Anecdotally, we at CORE have seen a similar phenomenon—schools where administrators provide clear, meaningful feedback to teachers on walk-throughs, extended classroom observations, and student data have seen the most improvement.

Willingham's full blog entry is located here: www.danielwillingham.com/1/post/2014/01/the-classroom-walkthrough-and-student-achievement.html

In addition, two Common Core State Standards (CCSS) resources related to this topic that you may find helpful can be found at our CORE website as well as the Oregon Department of Education's (ODE) website:

- CORE provides free CCSS resources for both literacy and math: curriculum analysis tools, lesson planning documents, and observation rubrics: www.corelearn.com/CCSS/CCSS-Materials.html
- The ODE's CCSS Toolkit – Examine Classroom Instruction module provides guidance on classroom walk-throughs and differentiates between formative (coaching) and summative (evaluative) goals for walk-throughs: www.ode.state.or.us/search/page/?id=3579

Reference

Grissom, J. A., Loeb, S., & Master, B. (2013). Effective instructional time use for school leaders: Longitudinal evidence from observations of principals. *Educational Researcher*, 42, 433–444.