Improving Educational Outcomes in America: Can a Low-Tech, Generic Teaching Practice Make a Difference?

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In 1981, the U.S. Secretary of Education created the National Commission on Excellence in Education, and charged it to study the quality of education in America and report its findings to the American people. The Commission's report, A Nation at Risk: The Imperative for Educational Reform, pulled no punches in describing how poorly American students fared on measures of achievement compared with students in other countries:

> [T]he educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. . . If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. (1983, p. 5)

A rallying cry for school reform, the report sparked three decades of efforts to improve educational outcomes by the federal government, state and local policy makers, administrators, teacher trainers, researchers, and the business community. Among the sometimes research-backed, often costly, and always well-intended attempts at educational reform since A Nation at Risk are the following: revamped teacher training models, high-stakes testing, parent and community involvement, numerous curriculum overhauls, inclusion of students with disabilities, grading school performance, charter schools, school choice vouchers, co-teaching, computers in the classroom, merit pay for teachers, multicultural education, action research, learning communities, reductions in class size, child-centered pedagogy, and No Child Left Behind. While positive outcomes of one kind or another (as well as faults, oversights, and various forms of mismanagement) can be attributed to each of these efforts to improve American education, "We are still a nation at risk," said former U.S. Secretary of Education William Bennett (April 2013).

Far too many students do poorly in school. They don't learn enough, and much of what they do learn is not mastered well enough to be useful. Just 26% of the nation's 1.8 million high school graduates who took The ACT in 2013 met the college readiness benchmarks in all four subjects tested (ACT, 2014).[1] The English benchmark was met by 64% of graduates, and the reading, math, and science benchmarks were met by 44%, 43%, and 37% of ACT test takers respectively.

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1 The ACT defines college and career readiness as the acquisition of the knowledge and skills a student needs to enroll and succeed in credit-bearing first-year courses at a postsecondary institution (such as a 2- or 4-year college, trade school, or technical school) without the need for remediation. Benchmarks are the minimum scores needed on the ACT subject area tests to indicate a 50% chance of obtaining a B or higher, or about a 75% chance of obtaining a C or higher in first-year college courses.

Fully 31% of college-bound high school graduates did not meet the benchmark for any subject area.

At an event marking the 30-year anniversary of A Nation at Risk, Chester Finn (April 2013) reached this conclusion on the state of American education: “We still have to get a whole lot more skills and knowledge into the skulls of many millions of young people.” Could teachers do that by using more effective instructional practices? The question is not meant to be snide. In most reform efforts, teaching—particularly in the form of explicit, systematic instruction aimed at imparting specific knowledge and skills—has been an undervalued, grossly misunderstood, or altogether missing component. That American educators seemingly forgot the central role and importance of explicit teaching was not lost on Tom Lovitt (1996), who offered this timely remedy: “Teachers must get back to the business of teaching. To do so they must increase their knowledge and skills about effective instructional strategies” (p. 85). [2]

Researchers have identified scores of instructional strategies, models, and techniques that improve student achievement (e.g., http://ies.ed.gov/ncee/wwc). Which ones should be front and center in every teacher’s repertoire? The Wing Institute for Evidence-Based Practice’s 2013 Summit aimed to tackle that question.

NARROWING THE FIELD

The Wing Summit’s organizers (Ronnie Detrich, Randy Keyworth, and Jack States) asked each of the 20 participants to submit a list of “the top 10 (plus or minus) skills for effective teaching.” The summiteers identified 46 practice elements in all including *teacher-student relations, data collection, classroom rules and procedures, formative assessment, guided practice,* and *cumulative review*, to name a few.

Recognizing that teachers cannot be expected to master and implement every practice, Ronnie, Randy, and Jack then asked participants to “prioritize those practices you consider most important.” Using a “weighted voting procedure,” summit participants ranked *high rates of student responding* as the most important teaching practice (see Figure 1).

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2 Tom Lovitt (1930–2013) pioneered effective teaching practices for difficult-to-teach children. A rarity in academia, he also wrote passionately and effectively for practitioners. Skillfully melding personal experience and empirical research in two of his books—*In Spite of My Resistance…I've Learned From Children* (1977) and *Because of My Persistence, I've Learned From Children* (1982)—Tom showed how teachers can not only enhance children’s academic and social skills, but enjoy their work at the same time. Both books should be required reading for every educator.

Practice Elements	Total Votes	Votes by Individual Summiteers																			
High rates of student responding	80	1	9		3	4	3	4	5	4	3	6	3	4	5	5	5	2	5	1	8
Teacher-Student relations	53	7		3	5	2	1	4	2	2	3			3	5	5	1	2	2	2	4
Classroom rules and procedures	49		3	3	2	4	2	1	3	2	2	3	3	2	3	3	3	2	3	2	3
Corrective feedback	45		3	3	3	2	2	1	3	1	1	3	3	3	3	3	3	3	1	1	3
Differential reinforcement	42		2		2			1	1	2		3	3	3	5	5	2	4	5	1	3
Formative assessment	42				5			2	5	1	2	6			5	5	3		5	1	2
Contingent specific praise	37		3	2	2	2	1	1	3	2			3	3	3	3	2	1		2	4
Data analysis	34		2		3	2	3	2	3	3			3	1	3		2	2		3	2
Mastery learning	30	1	2	4			2	1			1	6	2			3	4	1	1		2
Data collection	29		2			2	3	2	2	3			3		3		2	2		3	2
Data display/graphing	28		2		3		3	2	3	3			3		3		2	2		1	1
Structured environment	28			4		4	1	1	3	1	1		2	2	3			2	1	1	2
Guided practice	25	2			1		3		1	2	2	6	2	1			2	2		1	
Instructional design	25		2	4			3	4		2		4		4					1	1	
Teacher demonstration	23	5				2	2	1	1	2	1		2			1	2	2	1	1	
Quantity of instruction	22			2			1			3	3				3	4	2	2	1	1	
Real world opportunities to practice skills	22	3	2		5	4	2	1			2							1	1	1	
Class-wide group contingencies	20		2			2		1	3	2						1	2		4		3
Active supervision	18		2	1						2	1		2	2		3		1	3	1	
Instruction linked to "Big Ideas"	18		2				3	1	3	1	2		2	1				1	1	1	
Scope and sequencing	18	3		2			2	1		1	1	2		3						1	2
Groupings	17	2			4	5	1				1						1	2	1		
Instructional objectives	17		2					1		1	1	2	2	2		3				1	2
Personal organization	17			1		4		1		1	3				2			1	2	2	
School-wide expectations	16			5		2		1	1		1							1	3	2	
Cumulative review	15		2				2		1		3		2	1			1	1	1	1	
Errorless learning	15	1						1		2	2	3	2	4							
Problem solving	14	2	4		1	1			1		1			1				1	1	1	
Prompts and cues	12	2		2				1					2	1			1	2		1	
Pre-assessment	11	3			2			1			1						1	1	2		
Health	10			2				1			3							1		3	
Ignoring	10						1			1		2						1	1	2	2
Pre-teaching	10	2			2			1			1			2				1		1	
Questioning	10			2					1	1	2			1				2		1	
Peer coaching	9	5			1			1			1									1	
Spaced and massed practice	9						2	1			1		2	2		1					
Meta-cognitive strategies	8			4	2			1												1	
Guided notes	7	2		2		1			1												1
Instructional objectives tied to standards	7					2	2	1								1				1	
Student verbalization	7	4				1											2				
Token economies	6						1	1		1							2			1	
Behavior contracts	2																1			1	
Chaining	1							1													
Explicit reprimands	1	1																			
Response cost	1							1													
Time-out	0																				

FIGURE 1. INSTRUCTIONAL PRACTICES RECOMMENDED AND PRIORITIZED BY PARTICIPANTS AT THE WING INSTITUTE FOR EVIDENCE-BASED PRACTICES 2013 SUMMIT. EACH PARTICIPANT DISTRIBUTED 46 TOTAL "VOTES" AMONG THE PRACTICES.

We were given the additional assignment of grappling with this question: What practices yield the most learning bang for the teaching buck? We decided to tackle it in two steps: (a) identify impact and cost factors that may help decision makers prioritize teaching practices, and (b) apply those factors to the summiteers' highest ranked teaching practice as an exemplar. Appendix A shows the definitions and assumptions about education that guided our efforts, and the resulting ideas and arguments presented in this paper.

How Much Impact? At What Cost?

How much would widespread use of a given instructional practice impact student achievement? How much would it cost to train and support teachers' use of the practice? Rational, correct-enough-to be-useful answers to these questions will be an amalgamation of answers to dozens of interrelated questions and sub-questions about impact and cost. Figure 2 presents a starter set of such questions, the answers to which would yield pragmatic estimates of how much a teaching practice would improve student learning and the cost of implementing it on a school-building or district-wide level.

IMPACT – Answers to the following questions will help educators prioritize EBPs according to their impact on student learning.	**COST** – Answers to the following questions will help educators determine if the estimated impact of an EBP is worth the cost of implementing it.
Scope – To what extent is the practice effective with/across: ✔ Learners of different ages, characteristics (e.g., typical, students with disabilities, gifted/talented), and performance levels (e.g., struggling, beginner, advanced)? ✔ Curriculum content/subject matter (e.g., reading, math, science, music, art, vocational, domestic, self-care)? ✔ Stages of instruction/learning (e.g., acquisition, practice, fluency, application, generalization)? ✔ Instructional settings (e.g., academic classroom, science lab, playground, cafeteria, music room)? ✔ Instructional formats (e.g., whole class, small group, one-to-one, teacher directed, peer-mediated, self-directed, mobile devices)? ✔ A range of procedural variations (e.g., how much drift from the original procedure can be tolerated, what level of fidelity is needed)? ***Size of Effect*** – How big is the effect on student learning? ***Speed of Effect*** – How soon are positive effects obtained? ***Compatibility With Other EBPs*** – Does the practice support/contribute to the use of other EBPs?	***Equipment/Materials*** – How much will required equipment and materials cost? ***Teacher Training*** – How easy/difficult is the practice to learn? Can multiple in-service training formats be used? ***Logistical Fit*** – How compatible is the practice with existing demands on teachers' time and current school practices? ***Cultural Fit With Teachers' Beliefs*** – How consistent is the practice with educators' widely held ideas about teaching and learning? ***Acceptability to Students*** – Is the practice acceptable to students? Do they prefer it to business as usual?

Figure 2. **Impact factors and cost considerations for prioritizing evidence-based practices (EBPs) by their return on investment.**

THE CASE FOR HIGH RATES OF STUDENT RESPONDING

Ranking high rates of student responding at the top of their list of effective teaching practices was a solid choice by the summiteers. The positive correlation between increased student participation during instruction and improved learning outcomes is one of the most consistent, robust findings of educational research over the past 40 years.

DEFINING AND MEASURING STUDENT RESPONDING

Researchers have developed a variety of metrics for assessing the form and extent of student engagement; most notably, *on-task behavior, academic learning time (ALT)* (Fisher et al., 1980); *opportunities to respond (OTR)* (Greenwood, Delquadri, & Hall, 1984); and *active student responding (ASR)* (Heward, 1994). Figure 3 compares the amount of instruction and students' engagement associated with these and other widely used measures.

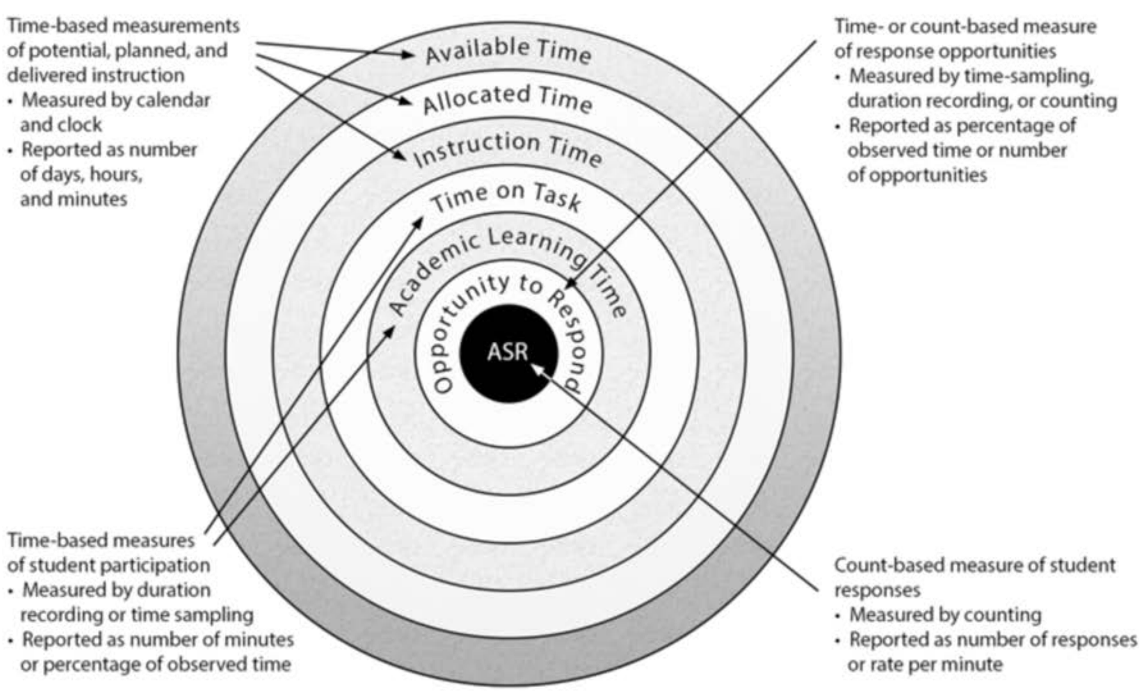

FIGURE 3. **ASR COMPARED WITH OTHER COMMONLY USED MEASURES OF INSTRUCTIONAL DELIVERY AND STUDENT PARTICIPATION. ADAPTED FROM HEWARD, 1994, P. 287**

Active student response occurs when a student makes a detectable, lesson-specific response.[3,4] The range of responses that qualify as ASR is as broad as the lessons teachers teach. Words read, sentences written, algebra problems solved, lengths and weights measured, musical notes played, historical figures named, or chemical compounds analyzed may count as ASR, depending on the lesson's purpose. *Count* is key, as the basic measure of ASR is the number of responses by a student during an observed period of instruction.

As a metric for student participation, ASR offers several advantages:

- ✓ ASR is a direct measure of the behavior of interest—student responses to instruction—whereas OTR is often reported as teacher behavior.[5]
- ✓ ASR is superior to time-based measures of student engagement. For example, on-task or ALT data showing that two students each spent 10 minutes engaged in a math task would not reveal that one student calculated 25 common denominators and the other student calculated just 5.
- ✓ ASR data are collected and reported as *frequency* measures (typically, number of responses per minute). Frequency (also called *rate of response*) is sensitive to changes in instructional practices and unlimited by ceilings as are measures of engagement reported as the number of minutes or percentage of observed intervals. A lesson resulting in 100% on-task behavior cannot be improved by that measure, whereas any lesson in which students make nearly any number of responses might be revised to yield

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3 All responding entails movement, which makes "active response" akin to "wet water" (is there any other kind?). The *active* in ASR, however, is purposeful redundancy to emphasize responses detectable by the teacher.

4 A close relative of ASR, the *learn unit*, includes all three components of an instructional trial: antecedent stimulus, student response, and consequence (Greer, 1994; Greer & McDonough, 1999).

5 While OTR was originally "viewed as the rate or frequency at which students engage in specific academic responses" (Stanley & Greenwood, 1983, p. 370), it was measured with an interval-based, time sampling system that coded six variables (subject of lesson, type of task, structure, teacher position, teacher behavior, and student responding) (Stanley & Greenwood, 1981) and yielded data that could be converted to estimates of time students were engaged. Today, OTR is most often considered a teacher behavior variable and reported as the number or rate of lesson-related questions or prompts the teacher provides to either the group or an individual student (e.g., Hollo & Hirn, 2015; Scott, Alter, & Hirn, 2011; Sutherland, Alder, & Gunter, 2003).

more ASR. Because ASR is the most direct and sensitive measure of a student responding during instruction, it is represented by the bull's-eye in Figure 3.

- ✓ ASR can be measured in lessons taught in any format (e.g., discrete trials, free operant responding); arrangement (e.g., teacher-led whole class or small-group lessons, peer tutoring, computer-assisted, self-study); setting (e.g., academic classroom, science lab, music room, gymnasium, community-based instruction); or curriculum area.
- ✓ ASR data are relatively easy to obtain: teachers—or students themselves—tally the number of responses.
- ✓ If accuracy of students' responses is also noted, ASR data can also show learning as it occurs.

From an ASR perspective, instructional time is not a primary independent variable related to achievement, but rather the ongoing dimension in which teaching and learning take place. From an ASR perspective, *the time a student is engaged is considered less important than the number of responses the student makes during that time*. An ineffective lesson made longer will likely remain a loser.

> *We are a much improved ball club, now we lose in extra innings!*
>
> Casey Stengel, New York Mets manager, 1961

Benefits of High Rates of Student Responding

When students respond often during instruction three benefits accrue: more learning, immediate feedback on the lesson's effectiveness, and less misbehavior.

More Learning

Decades of research have revealed and underscored the positive relationship between students' active engagement with academic tasks and their achievement (see reviews by Ellis, Worthington, & Larkin, 1994; Greenwood et al., 1984; Hattie, 2009; Rosenshine & Berliner, 1978; Swanson & Hoskyn, 2001). The increased-ASR-begets-more-learning connection has been replicated in experiments with general and special education students across a wide range of instructional formats and strategies, including whole-class instruction (e.g., Maheady, Michielli-Pendl, Mallette, & Harper, 2002; Narayan, Heward, Gardner, Courson, & Omness, 1990); computer-assisted instruction (Tudor, 1995; Tudor & Bostow, 1991); precision teaching and fluency-building activities (Codding, Burns, & Lukito, 2011; Kubina & Hughes, 2008); repeated reading (Alber-Morgan, Ramp, Anderson, & Martin, 2007; Tam, Heward, & Heng, 2006); error correction (e.g., Barbetta, Heron, & Heward, 1993; Drevno et al., 1994); and classwide peer tutoring (e.g., Greenwood, Maheady, & Delquadri, 2002; Maheady, Mallette, & Harper, 2006).

High rates of student responding is a central feature of powerful, evidence-based instructional models. Three examples:

Direct Instruction. The Direct Instruction Model is the most carefully developed and thoroughly tested program for teaching reading, math, writing, spelling, and thinking skills to children. Hattie's (2009) synthesis of the results of 304 Direct Instruction (DI) studies including more than 42,000 children obtained an effect size of 0.82, larger than any other curriculum or instructional program studied. All DI lessons feature high rates of ASR (Carnine, Silbert, Kame'enui, & Tarver, 2010; Marchand-Martella, Slocum, & Martella, 2004).

In Clear Teaching, Barbash (2012) described the role of choral responding

> The most visible efficiency features of DI programs are concise teacher scripts and choral student responses. . . Choral response maximizes the number of times individual children respond, per minute, per period. The script makes it possible for the experienced teacher to present 9–12 tasks per minute. If there are twenty children in the group and all respond to each task, the teacher teaches far more children per minute than would be possible by calling on them one at a time. (Barbash, 2012, p. 24)

Morningside Model of Generative Instruction. The Morningside Academy in Seattle is so confident in the effectiveness of its curriculum and instruction that parents receive a money-back guarantee that their child will progress at least two grade levels in the skill area of greatest deficit in 1 year at the school. In 33 years, Morningside has returned tuition for less than 1% of its students. Morningside teachers skillfully use an interrelated set of research-based instructional strategies that encompass active student responding, including Direct Instruction, precision teaching, think-aloud-problem solving, and SAFMEDS flashcards (Eshleman, 2000). Morningside founder and executive director Kent Johnson:

> We focus a lot of our teacher coaching on rate of active student responding. Primary grade programs in beginning reading and math, for example, require approximately 10 to 15 correct responses per minute. More advanced reading programs in the intermediate and middle school grades require fewer correct responses per minute because response duration is longer and smaller components are also being combined in more complex tasks which require more prior covert responses ("think time"). For example, we're looking for 8 to 10 correct main ideas in short passages in 3 minutes, and 3 correct decisions per minute about whether the author's purpose is to inform, entertain or persuade. (2013, personal communication)

Headsprout Early Reading. The computer-based Headsprout program uses multiple learner-program interactions with 80 cartoon-themed episodes (i.e., lessons) to teach the phonemic awareness, phonics, fluency, vocabulary, and comprehension skills and strategies necessary to decode words and read with understanding at a beginning second grade level (Layng, Twyman, & Stikeleather, 2003; Twyman, Layng, Stikeleather, & Hobbins, 2005). Headsprout is a powerful example of the speed and strength of skill acquisition that occurs when learners respond to skillfully designed curriculum examples and receive consistent feedback in the form of reinforcement and error correction—and also the fun that can be had while learning. Primary program architect, Joe Layng on the amount of ASR in a typical *Headsprout* lesson:

> In our Early Reading program, learners make an average of 180 responses in each 20-minute episode. In the reading comprehension program, learners make multiple recorded responses to each passage, as well as many unrecorded responses. They do this to hundreds of passages of increasing difficulty as they proceed through the program. More practice is provided for select interactions based on performance. (2013, personal communication)

Longitudinal studies of early language acquisition and research on the development of expert-level performance provide further evidence for the frequent responding-more learning relation. Children learning to talk practice their new skill relentlessly, actively participating in thousands of learning trials every day (Hart & Risley, 1995, 1999). Expert mathematicians and scientists, world-class musicians and artists, and elite athletics typically spend years engaged in deliberate practice at their craft (Ericsson, 1996; Ericsson, Krampe, & Tesch-Römer, 1993).

How much practice do students need to achieve acceptable learning outcomes? Siegfried Engelmann, who observed children responding to instructional examples for decades while developing the Direct Instruction Model, contends that "the amount of practice required is five times what teachers expect" (1992, p. 17). But suggesting any specific number of practice trials as necessary or ideal would be arbitrary. The number of trials will vary considerably by learner, curriculum content, the mix of new and previously learned examples, response topography, relevant stimulus controls (e.g., simple paired associate or more complex conditional discriminations), frequency and form of reinforcement, whether or not and how errors are corrected, and so on.

While too much practice is rare in most classrooms (e.g., Chard & Kame'enui, 2000; Scott, Alter, & Hirn, 2011; Stichter et al., 2009), common sense and some research suggest there are ceilings above which additional practice is a waste of time. Just as longer lessons are not necessarily better lessons, more ASR is not always better. For example, Tony Cuvo and colleagues found that having students practice spelling words 10 or 15 times resulted in no better learning than did 5 practice trials (Cuvo, Ashley, Marso, Bingju , & Fry, 1995).

The sweet spot for the number of practice trials is a moving target, but the second major benefit of frequent ASR helps teachers identify and hone in on it.

Immediate Feedback

> *When you pitch a strike, Mr. Hornsby will let you know.*
>
> Legendary baseball umpire Bill Klem

Just as Rogers Hornsby let a pitcher know he had thrown a strike by smacking it for a hit, students let teachers know they are presenting effective lessons by the accuracy and firmness of their responses. The immediate feedback enables teachers to adjust a lesson on the fly by providing additional practice opportunities on a particular concept or skill; skipping ahead as students' performance dictates; and identifying students who would benefit from additional individualized practice.

Kent Johnson and Libby Street (2012) described how teachers at Morningside Academy use feedback from student responses to move from one level of instruction to another during the lesson:

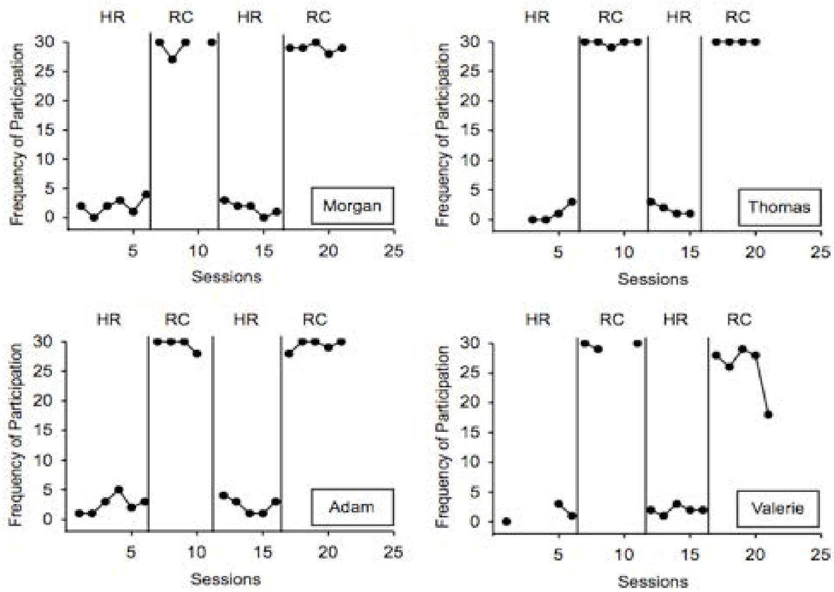
> The teacher may decide she has provided enough demonstration and provide an opportunity for students to move to the "guided opportunity" stage only to observe many student errors. In such cases, she would provide additional demonstrations until it appeared that students "got it." She'd then provide another guided opportunity. Similarly, after students perform accurately with guidance, the teacher will offer a test of performance without guidance. Should students make errors at this stage, the teacher would return to the guided opportunity stage. This recursive process continues until students perform independently and correctly. (p. 22)

Less Misbehavior

When their teachers use high-ASR instructional tactics, students are less off-task and disruptive. This relationship has been replicated in experiments with pre-K through secondary students; in urban, rural, and suburban schools; with typically developing students; and with students with disabilities (e.g., Armendariz & Umbreit, 1999; Carnine, 1976; Christle & Schuster, 2003; Davis & O'Neill, 2004; Godfrey, Grisham-Brown, Schuster, & Hemmeter, 2003; Haydon, Marsicano, & Scott, 2013; Sainato, Strain, & Lyon, 1987; Scott, Hirn, & Alter, 2014 Tincani, Ernsbarger, Harrison, & Heward, 2005; Wood, Mabry, Kretlow, Lo, & Galloway, 2009).

Improvements in student deportment are often immediate and dramatic when teachers shift from one-student-at-a-time participation to a high-ASR strategy. For example, one study targeted for observation nine fourth grade boys in two classrooms; the boys were the most disruptive and least attentive during math lessons and the lowest performers in math. Results showed substantial reductions in disruptive behavior for all nine observed students when high

ASR instruction via response cards was provided (Lambert, Cartledge, Heward, & Lo, 2006). In another study, Wood and colleagues (2009) observed the participation and off-task behavior of four students during morning “circle time” in an inclusive kindergarten classroom of 23 students. The students participated more frequently and were less off-task during the high-ASR response card condition (see Figure 4).



Notes: HR= Handraising, RC= Response Cards

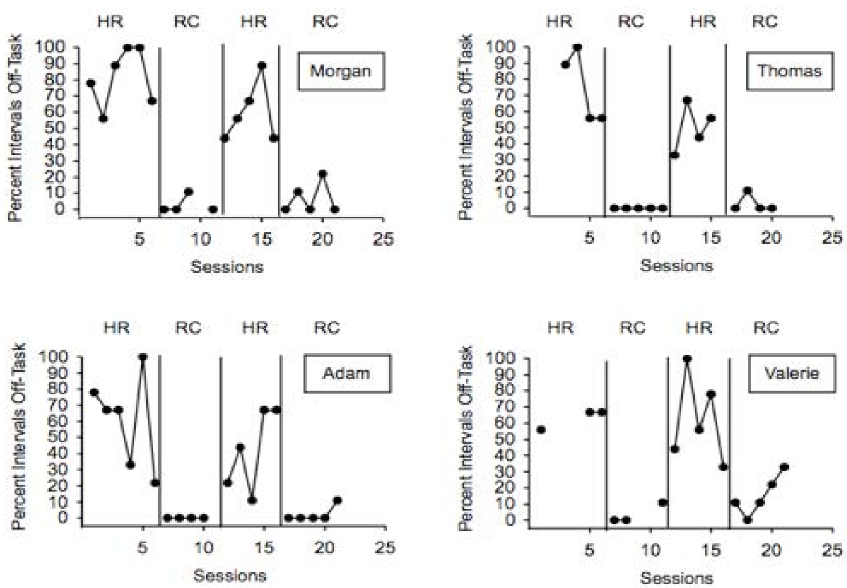


Figure 4. **Active student response (participation) and off-task behavior during circle time instruction by four kindergarten children during handraising (HR) and response card (RC) conditions. From Wood, Mabry, Kretlow, Lo, and Galloway, 2009, pp. 43–44. Permission to reprint was granted by the American Council on Rural Special Education.**

THE BIG CHALLENGE AND A POSSIBLE SOLUTION

Ask a thousand teachers if learning is improved and deportment better when students actively participate in a lesson, and all of them would answer in the affirmative (and no doubt wonder why anyone would ask such a no-brainer question). The challenge is keeping *all* students engaged during group lessons. And group instruction is the common instruction format in the regular classroom regardless of grade level (Hollo & Hirn, 2015). Scott et al. (2011) conducted 1,277 observations over 327 hours in all but a few of the elementary and secondary classrooms in four schools and found students spent 63% of available class time in group instruction (49% whole class, 14% small group).

Group instruction, whether with an entire class or smaller groups, presents teachers with five major tasks: maintaining students' attention, giving each student sufficient opportunities to respond, providing feedback for students' responses, monitoring students' learning, and preventing and dealing with disruptive behavior. Meeting these challenges can be so difficult that when students pay attention (e.g., look at the teacher, the board, or lesson materials; watch a classmate respond) and don't act out it is often taken as evidence of an effective lesson.

Let's be clear: Students paying attention is not a bad thing. On-task students are more likely to learn than are off-task and disruptive ones. The problem, however, is that students are typically considered "on-task" or "passively engaged" while making no lesson-related responses. For example, Scott and colleagues (2011) defined "passive engagement" as follows:

> The student was [considered] passively attending to instruction—either by orientation to teacher, performing peer, or materials (i.e., tracking with eyes) *but was not required to do anything other than listen or observe*. Examples included a student sitting quietly at desk and facing the teacher who is instructing and a student sitting quietly with collaborative work group but not actively speaking, writing, or otherwise working on an activity. (p. 629; emphasis added)

Of all the categories of student behavior Scott and colleagues measured, passive engagement was recorded the most often. Collectively, the students were not actively engaged with instruction for 61% of their time in class (42% passive engagement; 13% off-task; and 6% "down time" when no task or expectations were apparent).

Recitation by one student at a time is the most common method for obtaining student participation during group instruction; the teacher poses a question or problem, students who wish to answer raise their hands, and the teacher selects a student to answer. While the technique provides ASR for the student called upon to answer, his or her classmates are usually passive observers at best. Calling upon individual students to respond is problematic for another reason: high achievers answer most questions while low achievers, for whom active participation is needed most, make few or no responses (Maheady, Mallette, Harper, & Sacca, 1991).

Teaching practices that enable all students in the class/group to respond simultaneously offer one solution to these problems. Research and teachers' experience support the effectiveness and practicality of several such techniques, chief among them choral responding (Heward, Courson, & Narayan, 1989), response cards (Randolph, 2007), guided notes (Konrad, Joseph, & Itoi, 2011), and classwide peer tutoring (Maheady et al., 2006). The return on investment for a wide-scale implementation of each of these high-ASR techniques will vary as a function of its impacts and costs relative to business as usual. As an example, the impact and cost questions in Figure 2 will be applied to choral responding.

CHORAL RESPONDING: LOW-TECH TACTIC FOR HIGH-RATE ASR

Choral responding—students responding orally in unison to a series of questions presented by the teacher—is the simplest, quickest way to increase student participation during group lessons. In contrast to a rowdy class of off-task students, choral responding provides "good noise": the sound of students' voices engaged in active learning. The basic procedure and suggested guidelines for conducting choral responding are described in Figure 5.

- Give Clear Directions and Model the Activity – Tell students the types of questions that will be asked and demonstrate one or two trials by acting out the roles of teacher and students. For example: "How many hydrogen atoms in a molecule of methane?" [pause briefly, give signal for students to respond] "Four."

- Provide a Brief Thinking Pause Before Signaling Students to Respond – Let the complexity of the question/problem and students' relative level of mastery determine the duration of the pause. If a thinking pause greater than 4 or 5 seconds is required for students to answer, break the content into smaller chunks

- Signal Students to Respond – Use a clear, consistent auditory and/or visual signal for students to respond. For example, "Class," "How many?," a finger snap, or a hand or arm movement. Saying "get ready" immediately before signaling the students' response promotes unison responding.

- Provide Feedback – When only correct answers are heard: (1) give confirmation and/or praise (e.g., "Yes!/All right!" "You got it." "Great!") and (2) present the next question, item, or problem. When one or two incorrect responses are heard: (1) confirm the majority response and restate the correct answer in context with the question for the students who erred (e.g., "Yes. A molecule of methane contains hydrogen atoms.") and (2) a few trials later present the same question again. When more than a few incorrect responses are heard: (1) state the correct answer with a brief explanation, (2) immediately repeat the same question and signal a choral response, and (3) several trials later present the same question again.

- Intersperse Individual Turns – Now and then, instead of signaling a unison response, call on an individual student to answer the question. Present the question before calling a randomly selected student's name so students cannot predict when they will be called on. Individual turns can also be used to give low-achieving students opportunities to shine in front of their classmates. After a low-achieving student chorally voices a correct response, the teacher repeats the question several trials later and calls on that student to answer individually.

- Maintain a Lively Pace. Students make more responses, respond with higher accuracy, and engage in less off-task behavior when teachers conduct CR at a fast pace. Preparing questions and examples prior to the lesson enables the teacher to focus on students' responses and move without hesitation from one learning trial to the next.

FIGURE 5. **GUIDELINES AND SUGGESTIONS FOR CHORAL RESPONDING**

Although teachers have used CR since the days of the one-room schoolhouse, research on its effects is a more recent phenomenon. Peer-reviewed studies reporting positive effects of CR on ASR, learning, and deportment have been published since the late 1970s (e.g., Haydon, Conroy, Scott, Sindelar, & Orlando, 2010; Maheady et al., 2002; McKenzie, & Henry, 1979; Pratton & Hales, 1986; Sainato et al., 1987; Sindelar, Bursuck, & Halle, 1986; Sterling, Barbetta, Heward, & Heron, 1997).

IMPACT FACTORS

Key factors to consider when assessing the expected impact of a teaching practice are scope of application, size of effect, speed of effect, and compatibility with other evidence-based practices.

Scope of Application

Impact judgments related to scope of application should consider the extent to which a teaching practice is effective when implemented with various learners and curriculum content, learning stages, instructional settings and formats, and implementation variations.

Learner variables. CR has been used successfully with students from preschool through high school (Rose & Rose, 2001; Sainato et al., 1987); with general education students (Kretlow, Cooke, & Wood, 2012; Kretlow, Wood, & Cooke, 2011; Maheady et al., 2002) and with special education students with various disabilities (Alberto, Waugh, Fredrick, & Davis, 2013; Cihak, Alberto, Taber-Doughty, & Gama, 2006; Flores & Ganz, 2009; Kamps, Dugan, Leonard, & Doust, 1994; Sterling et al., 1997).

Curriculum content. CR can be used effectively with any curriculum content that meets three criteria: (a) each question, problem or item presented has only one correct answer; (b) each question can be answered with a brief oral response or verbal chain (e.g., counting by 5); and (c) the material is suitable for a lively paced presentation. CR has been used in lessons to teach basic academic tools skills, subject matter content, and a series or sequence of steps to solve higher level problems (e.g., math word problems).

Stage of instruction/learning. When introduced (or reintroduced) to CR, many teachers quickly see the technique's value for reviewing previously taught concepts and skills. CR should not be limited to review; the practice can also be used effectively during acquisition, application, and generalization stages of learning. For example, Figure 6 shows a script for a CR-based lesson that teaches elementary students the meaning of new words with synonyms or short definitions.

Teacher's Direction or Question	Students' Choral Response
Listen, *examine*. Say it.	Examine
Examine means look at. What does examine mean?	Look at
I'll say some sentences. You tell me "*examine* or *not examine*." Aunt Rachel listened to the birds sing. Did she *examine* or not examine?	Not examine
How do you know?	She didn't look at the birds.
The doctor looked at the cells carefully through her microscope. Did the doctor examine or not examine?	Examine
How do you know?	The doctor looked at the cells.
James crouched down and saw that a nail had punctured his tire. Did he examine or not examine?	Examine
How do you know?	He looked at the tire.
Repeat with more examples and non-examples.	

FIGURE 6. **SAMPLE SCRIPT FOR CHORAL RESPONSE–BASED LESSON ON USING A SYNONYM OR SHORT DEFINITION TO LEARN THE MEANING OF A WORD FROM A KNOWN CONCEPT. ADAPTED FROM A PROCEDURE DESCRIBED BY CARNINE, SILBERT, KAME'ENUI, AND TARVER (2010).**

Instructional settings. CR works well in whole class or small group instructional settings. It can be used to prime students' background knowledge when introducing new content (Coyne, Kame'enui, & Carnine, 2011), to intersperse throughout a lesson, and to provide a brief end-of-lesson review. CR can also improve transitions from one classroom activity or location, and provide ASR on academic and social skills (Connell, Randall, Wilson, Lutz, & Lamb, 1993; Johnson, 1990).

Instructional formats. While CR is most often teacher-directed, paraeducators can also lead small groups of students in a CR review session (Cooke, Galloway, Kretlow, & Helf, 2011; Courson & Heward, 1988). An additional resource for teachers is students. They often enjoy leading CR review sessions and quickly learn to imitate the technique, including signals, error correction, and pacing.

Implementation formats/qualities. High-fidelity implementations of evidence-based practices (EBPs) are more likely to yield results consistent with the research than are sloppy, inconsistent implementations (Wanzek & Vaughn, 2006). Practices that must be implemented within a very tight range of tolerances, however, are more limited in scope than those that work across a range of variations. CR does not have to be perfectly executed to produce ASR and more learning. During times when it is necessary to have a quiet classroom (e.g., the class next door is taking a test), teachers can replace CR with other easy-to-see hand or finger responses (McKenzie & Henry, 1979). Students can respond by holding up their fingers to match a multiple choice answer (Pratton & Hales, 1986) or show "thumbs up" or "thumbs down" to indicate a response. Younger students can make a "Simon Says" response (e.g., "Touch your ears if the answer is true, touch your nose if the answer is false.").

SIZE OF EFFECT

Active student responding. Unison or group response techniques can produce very large increases in ASR. In one study, when a fourth grade teacher implemented response cards in daily 20-minute social studies lessons, her students each answered 30 more questions per lesson than when they were called upon singly to answer (Narayan et al., 1990). Extending the difference of using response cards for just 20 minutes per day over the course of a 180-day school year would result in more than 5,000 additional academic responses per student.

CR produces higher rates of ASR than response cards. Teachers routinely generate student ASR rates from 3 to as many as 12 per minute depending upon the curriculum content and students current level of performance. If their teachers used CR in multiple lessons across the school day, students would make tens of thousands more responses per school year; perhaps a million more in a K–12 career.

If students left high school having made a million more responses in the classroom, would that be enough to close the achievement gap? Perhaps researchers will answer that question someday, but we don't know now. As Cathy Watkins, leading authority on DI wisely noted, "It takes what it takes" (personal communication, 2013). High-ASR tactics such as CR can reduce the amount of time needed to provide students "what it takes."

Learning. CR promotes instructional strategies with the largest effect sizes on achievement: cumulative review (0.88), quantity of instruction (0.84), high rates of responding (0.71), student verbalization (0.64), and mastery learning (0.58) (Hattie, 2009; States, 2013.

Speed of Effect

Viewed against the tremendous amount of curriculum students are expected to learn, teaching is a race against the clock. Instructional methods that produce results quickly are especially critical for low-performing students, and students with disabilities who are already behind must be "taught more in less time" to catch up (Kame'enui & Simmons, 1990, p. 11).

When used in a well-designed program, CR can produce measurable learning outcomes in a single lesson (Kretlow et al. 2011; Wood & Heward, 2014). For example, Figure 7 shows scores by 16 kindergarten students on 10-item paper and pencil pre- and posttests given immediately before and after a CR-based 12-minute lesson on using the > and < math symbols. Increasing ASR, by CR or any other method, is no guarantee of improved learning. Students must respond to a well-designed sequence of examples and non-examples, and receive corrective feedback, as illustrated in the script for the > and < lesson shown in Figure 8.

Teacher and student script	**Number sets on the chalkboard**	
Step 1: Identify the bigger number	Before	After
Teacher: "I'm going to point to some numbers. When I touch under the numbers, you say which number is bigger." *Point under the first set*. "Get ready." **Students:** "Eight" **Teacher:** "Yes, eight is correct!" *Teacher circles the number eight and touches under the next set*. "Get ready." **Students:** "Seven." **Teacher:** "Way to go! Seven is bigger than two! *Teacher circles the number seven.* *Repeat for last three sets.* *Erase numbers and write new number sets.*	8 3 2 7 9 10 7 6 4 3	⑧ 3 2 ⑦ 9 ⑩ ⑦ 6 ④ 3
Step 2a: State rule about bigger numbers	Before	After
Teacher: "Listen to this rule. The big number gets two dots. Say that." **Students:** "The big number gets two dots." **Teacher:** "Yes, the big number gets two dots. *Point under the first set of numbers*. "When I touch under the numbers, you say which number is bigger." *Point under the first set.* "Get ready." **Students:** "Six" **Teacher:** "You got it! Six is bigger! So, which number gets two dots? **Students:** "Six" **Teacher:** *Makes two dots next to the six* (shown in the after box). *Repeat for next two number sets.*	3 6 5 8 4 1	3 :6 5 :8 4: 1
Step 2b: State rules about bigger and smaller numbers	Before	After
Teacher: "Listen. The big number gets two dots. Say that." **Students:** "The big number gets two dots." **Teacher:** "Listen. The small number gets only one dot. Say that." **Students:** "The small number gets only one dot." *Repeat until students can firmly say both rules.* **Teacher**: *Point under the third set of numbers*. "Which number is bigger? Get ready." **Students:** "Ten" **Teacher:** Yes, ten. So, which number gets two dots? **Students:** "Ten" **Teacher:** *Makes two dots next to the ten.* "Which number gets only one dot? **Students:** "Five" **Teacher:** "Super work. Five only gets one dot. *Makes one dot next to the five.* *Repeat next two sets. Erase and write new number sets.*	10 5 0 3 6 4	10: ·5 0· :3 6: ·4

Step 3: Draw > and < symbols	Before	After
Repeat Step 2b with new number sets. After the first set, show students how to connect the dots. **Teacher:** "Now I'm going to show you how to connect the dots. Watch me." *Draw a line from the higher dot of the bigger number to the single dot of the smaller number, and back to the lower dot of the bigger number.* (See after box) *Present the remaining number sets.* *Show examples of correctly drawing lines and examples of incorrectly drawing the lines. Have* ***students*** *CR if you are "right" or "wrong."* *Erase and write new number sets.*	4 1 9 3 8 7 0 10 4 5	4 > 1 9 > 3 8 > 7 0 <10 4 < 5
Step 4: Read number sentences with > and < symbols	**Before**	**After**
Repeat steps 1 –3. After the first number set, show students how to read the number sentence: **Teacher:** Listen. Another word for bigger is greater. What is another word for bigger? **Students:** "Greater." **Teacher:** "Yes, another word for bigger is greater. Way to go! **Listen.** Another word for smaller is lesser. What is another word for smaller? **Students:** "Lesser" **Teacher:** "You got it! I will read the first number sentence. Watch and listen. **Teacher:** "Eight is greater than two." Your turn to read the number sentence. **Students:** "Eight is greater than two." *Repeat for remaining number sets.* *Write more number sets. Have students CR through all the steps. Call on an individual student at times to assess his or her performance.*	8 2 8 10 4 7 3 1 6 8	8 > 2 8 <10 4 < 7 3 > 1 6 < 8

Figure 7. **Script for a choral response–based lesson to teach > and < math symbols. Procedure based on Engelmann, Carnine, Kelly, and Engelmann (1996). Prerequisite skill needed: Students can identify the larger number in a pair of numbers from 0 to 10. Teachers should adjust the number of sets presented and repetitions based on students' performance. Adapted from Wood & Heward, 2014.**

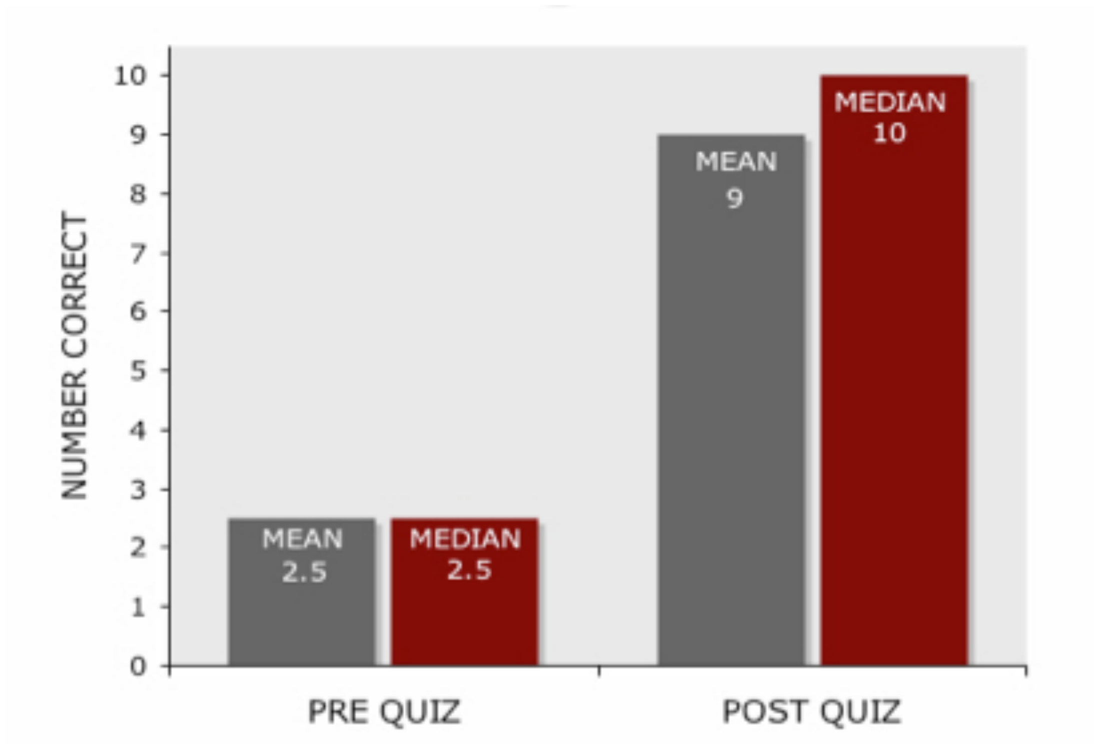


FIGURE 8. MEAN AND MEDIAN SCORES BY 16 KINDERGARTEN STUDENTS ON A 10-ITEM QUIZ ADMINISTERED BEFORE AND AFTER A 12-MINUTE CHORAL RESPONSE BASED LESSON ON > AND < MATH SYMBOLS. FROM WOOD & HEWARD, 2014.

COMPATIBILITY WITH OTHER EFFECTIVE PRACTICES

A teaching practice that increases the likelihood that other effective practices elements will also be used has wider scope and potentially more impact than a practice that tends to be implemented in isolation. When using CR, teachers increased opportunities to provide more praise and approval, and to correct errors. CR is easily implemented in tandem with other ASR tactics, is a natural activity for group contingencies, and provides an effective way to include students with disabilities.

Praise and approval*. Describing the pioneering experimental demonsrations of the power of adult attention as reinforcement for children's behavior that took place in the 1960s, Todd Risley (2005) wrote:*

> We had never seen such power! The speed and magnitude of the effects on children's behavior in the real world of simple adjustments of something so ubiquitous as adult attention was astounding. Forty years later, social reinforcement (positive attention, praise, "catching them being good") has become the core of most American advice and training for parents and teachers—making this arguably the most influential discovery of modern psychology. (p. 280)

In spite of decades of research showing that contingent teacher praise and approval is an effective instructional tool, researchers consistently find very low rates of teacher praise in both general and special education classrooms (Kratochwill & Stoiber, 2000; Maggin, Wehby, Moore Partin, Robertson, & Oliver, 2011). Supporting teachers' use of CR and other high-ASR practices might help combat the scarcity of praise and approval in the classroom. Several studies have found that when teachers increase ASR, they praise more often (Gunter, Denny, Jack, & Shores, 1993; Sutherland, Wehby, & Yoder, 2002).

Error correction. In Hattie's (2009) comparative analysis of instructional practices, an effect size of 0.73 ranked feedback in the top 10 of all possible instructional practices in terms of facilitating student learning. Correcting students' mistakes is a critical element of performance feedback. Error correction is so important to performance feedback that Engelmann and Bruner (2008) proclaimed, "The major difference between the average Reading Mastery I teacher, who teaches most of the children, and the outstanding teacher, who teaches all of the children, is the ability to correct." (p. 11)

Student responses during a CR activity provide immediate feedback for teachers on whether or not the students are "getting it." When students are "not getting it," teachers can (and should) correct errors immediately, review the missed skill later, and/or step back and reteach prerequisite skills (see Figure 3 for suggested procedure).

Other ASR strategies. CR doesn't have to be a stand-alone teaching technique. For example, CR can be used in combination with other research-based strategies such as response cards (Heward, Gardner, & Cavenaugh, 1996), guided notes, structured worksheets (Konrad et al., 2011), learning-strategy instruction (Schumaker & Deshler, 2006), and scaffolding through "model-lead-test" to introduce a new skill or a correct errors (Watkins & Slocum, 2004. Kretlow et al., 2012).

Multitiered instruction. CR can enhance instruction across levels of support in multitiered models such as Response to Intervention. Kretlow and colleagues (2011, 2012) showed that the effectiveness of Tier 1 group instruction improved when elementary teachers received in-service training and coaching on how to embed choral responding into their lessons.

Cost Considerations

Implementing a teaching practice on a school-building or school-district level entails costs for purchasing equipment and materials, and training teachers. Additional expenditures may be required to overcome obstacles to implementation depending upon the logistical demands of the practice and its cultural fit. While we make no estimates of the real dollar cost of implementing CR, which would no doubt vary widely, the cost-related issues/questions identified here may be useful to decision makers.

Equipment/Materials

Teachers can build CR into many lessons. CR requires no special equipment or materials and can be used in conjunction with existing curriculum materials. For example, Bursuck and colleagues (2004) taught general education teachers to use choral responding and error-correction techniques to enhance a published, core-reading program (Opencourt Reading).

Training Requirements

CR is a relatively simple, low-tech practice (see Figure 4) that teachers report is easy to learn and use (Haydon et al., 2010; Kretlow et al., 2011; Sainato et al., 1987). CR can be taught via any in-service teacher training or professional development medium or format: direct modeling/coaching, (Cooke, et al., 2011; Kretlow et al., 2011, 2012), how-to articles and booklets (e.g., Heward et al., 1989), video demonstrations (e.g., Heward, 2013), webinars and online training modules, and even the much-maligned one-shot workshop.

While workshops are routinely criticized for having little impact on teacher behavior (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007), when conducted with lots of ASR, guided practice, and independent practice, teachers can learn to do CR fairly well in a half-day workshop (Schnorr, 2013). Follow-up coaching yields better results than one-day in-service alone (Kretlow & Bartholomew, 2010).

Logistical Fit

Considering the demands on teachers' time (e.g., paperwork, testing), CR can be a good logistical fit because it requires virtually no prep time. By embedding brief sessions throughout a school day, teachers can enhance their instruction without the burden of developing new lessons and materials (e.g., Bursuck et al., 2004; Kretlow et al., 2011).

Cultural Fit with Teachers' Beliefs

A practice that is consistent with teachers' beliefs about their role as educators and how students learn stands a better chance of being implemented than does a practice that challenges those beliefs. A significant impediment to widespread adoption of CR may be educators' widely held notions about teaching and learning (Heward, 2003). For example, while CR's central role in Direct Instruction demonstrates its effectiveness, the association of CR with DI diminishes the practice's value in the eyes of many educators. As John Stone (2012) explained, the features that make DI so effective . .

> . . are profoundly at odds with the beliefs about good teaching that have come to dominate education. DI is rejected not because it doesn't work—it does—but because it challenges the validity of those beliefs.

> For decades and especially since the sixties, teachers have been taught to be "a guide on the side, not a sage on the stage." This ideal regards Direct Instruction and similar approaches as the antithesis of good teaching. Thus, education professors and theorists denigrate DI's teacher-led practice as "drill and kill," its high expectations as "developmentally inappropriate," and its emphasis on building a solid foundation of skills as "rote-learning." (pp. 2–3)

While these notions encourage classroom practices that are often the complete opposite of what scientific studies of effective instruction recommend (e.g., Carnine, 2000; Heward, 2003; 2005; Heward & Silvestri, 2005; Kauffman, 2010; 2011; Rosenshine, 2012; Sasso, 2001), they continue to be promoted by many teacher education professors.

On the hopeful side, several recent popular books and articles for educators that emphasize the importance of explicit practice are challenging these notions. For example, in *Practice Perfect: 42 Rules for Getting Better at Getting Better*, authors Doug Lemov, Erica Woolway, and Katie Yezzi (2012) explained:

> "…Arguing in favor of more drilling would set many American educators on edge. Many educators perceive drilling—which they characterize with the pejorative "drill and kill"—to be the opposite, the enemy, of higher-order thinking. To them, an explicit correlation between imagination and drilling would be anathema. Learning that asks students to memorize and automate will reduce their ability to generate creative thoughts and make cognitive leaps, such educators might argue.
>
> The problem with that argument is that learning generally doesn't work that way. As cognitive scientists like Daniel Willingham have shown, it's all but impossible to have higher-order thinking without strongly established skills and lots of knowledge of facts. Cognitive leaps, intuition, inspiration—the stuff of vision—are facilitated by expending the smallest amount of processing capacity on lower-order aspects of a problem and reapplying it at higher levels. You leap over the more basic work by being able to do it without thinking much about it, not by ignoring it. . . Creativity often comes about because the mind has been set free in new and heretofore encumbered situations. (pp. 37–38)

In The Teacher's Craft: The 10 Essential Skills for Effective Teaching, Paul Chance (2008) was adamant about the importance of frequent practice "[I]f you want your students to achieve a high level of mastery, to retain what they learn, and to be able to use what they learn in a variety of situations, there is no way to achieve those goals without providing lots of practice" (p. 88, emphasis in original).

Other authors of recent books or articles drive home the same point. In Teach Like a Champion: 49 Techniques That Put Students on the Path to College, Doug Lemov (2010) referred to CR as the “call and response” technique, as an effective teaching strategy. Jim Knight’s (2013) High-Impact Instruction: A Framework for Great Teaching includes a variety of group response techniques as a means of assessing students’ knowledge during a lesson. Finally, distinguished educational researcher Barak Rosenshine (2012) reminded us, “The best way to become an expert is through practice—thousands of hours of practice. The more the practice, the better the performance.” (p. 19)

Where does CR fall on the teacher acceptability scale? It’s a mixed bag for sure; perhaps containing more negative factors than positive, and teachers might question the extent to which CR is really necessary (see Figure 9). On the other hand, the ease of using CR and the fact that it can be done for just a few minutes at most any time of the school day, make it more likely teachers will give it chance. If teachers then find students enjoy CR and engage in less off-task behavior, they may continue to use the practice, and use it longer and more frequently during the day.

Q: I already provide a lot of interesting, hands-on activities for my students and they seem really engaged. My lessons are very engaging. Would my students still benefit from CR?

A: Yes, of course. CR can be used to enhance a lesson and help students buildmastery.

Explanation: The problem is that many teachers define "engagement" by the activity or materials (e.g., elementary students making shoebox dioramas of their favorite scenes from Charlotte's Web) rather than measurable responses to instruction (i.e., ASR) and outcomes. For example, after an "engaging" week of building their Charlotte's Web dioramas, several fourth graders have not made progress toward the unit's objectives (e.g., identifying themes, comparing and contrasting with other stories or real events). On the other hand, if the students were engaged (observable, measureable responses) in brief CR previews and reviews of new vocabulary for past and upcoming chapters, they would be more confident and prepared when they tackle their Charlotte's Web reading comprehension and writing assignments.

Q: CR is only for basic skills instruction, right?

A: CR can help build students' fluency of academic tool skills, but it is not limited to basic skill instruction.

Explanation: Higher level skills (e.g., solving math word problems) are supported by several component skills (e.g., simple facts, rule relationships, concepts, strategies; Kame'enui & Simmons, 1990). CR can be used in teaching across a hierarchy of knowledge forms. A special education teacher could use CR when teaching her students to solve math story problems (Jitendra, 2002). For example, she might say, "Everyone, tell me what the beginning set is in this story problem (Students: "47"). Yes, good, the beginning set is 47. Ok, everyone tell me the change set. (Students: "Unknown!). That's right, the change is unknown. Tell me the ending set (Students: "32"). Yes, so what's the total? (Students: "32"). Ok, class, tell me the rule if the total is known. (Students: If the total is known, subtract to find the part). Yes, very good. Go ahead and subtract to find the answer, then get ready for the next one, it's a tough one!

Q: I watched a teacher doing choral responding with her students and they were just giving one-word answers. How is that real learning?

A: Like the previous answer and explanation, single responses or a chain of responses are the building blocks of higher level skills. Ultimately, "real learning" can be determined by the extent to which the one-word or short answers become part of a larger composite skill that generalizes to new skills and settings and maintains over time (Heward, 2003).

Explanation: The single response by itself doesn't give the full picture of learning. The three-term contingency (antecedent-behavior-consequence) is the basic unit of instruction (Heward, 1994). So, it's important to consider the antecedent (e.g., motivating operations, discriminative stimuli), behavior, and consequence (e.g., praise, corrective feedback) conditions when evaluating the quality of instruction. For example, for every question below, the students' short, correct answer will be "a hammer" even though the complexity of the question (antecedent stimulus) changes.

Teacher: (shows a picture of a hammer) What's this?

Students: A hammer.

Teacher: Listen: James has every kind of tool. A hammer is a tool. So, what do you know for sure that James has?

Students: A hammer.

Teacher: What did the Norse God Thor have that symbolizes power?

Students: A hammer.

Figure 9. Some Frequently Asked Questions About Choral Responding.

Acceptability to Students

Students like to be busy. They like things that are upbeat and fast-paced. They like to be loud. CR lets students be active participants rather than quiet, passive observers of instruction. Remember, CR is "good noise." In high-ASR activities such as choral responding or response cards, students don't have to quietly raise their hands and wait to be called on. They can get in on the action right away. For example, in a social validity interview about using response cards, one kindergartner noted, "I like them because we don't have to raise our hand, then talk. It's longer to raise our hand" (Wood et al., 2009, p. 44).

MAKING DIFFERENCES THAT MATTER

American education needs to do better by its students, and educational reforms must focus on making differences that matter (Vanderheyden, 2013). Could choral responding help teachers "get a whole lot more skills and knowledge into the skulls of many millions of young people" (Finn, 2013)? As Mary Beth Celio (2013) noted, there is no "magic metric" that will trigger all the changes needed to reform education, but ASR is a good place to start.

ASR is a direct, sensitive, and accessible measure that sheds light on what Benjamin Bloom (1980) called alterable variables: factors that make a difference in student learning and that teachers can control. As a tactic for increasing ASR and in turn learning, we believe choral responding can be considered a high-leverage teaching practice.

> A "high-leverage practice" is an action or task central to teaching. Carried out skillfully, these practices increase the likelihood that teaching will be effective for students' learning. They are useful across a broad range of subject areas, grade levels, and teaching contexts, and are helpful in using and managing differences among pupils. (TeachingWorks, 2015)

Although the information and collection of arguments put forth in this paper hardly rise to the level of a critical analysis, we believe this assessment of impact and cost considerations suggests that choral responding would provide a solid return on investment.

We don't claim that widespread use of CR in America's classrooms with some degree of effectiveness constitutes educational reform or will raise students or a professional development program, but it could be a start. But CR is a high-leverage practice that should be in every teacher's repertoire. Choral responding offers teachers one way to follow Tom Lovitt's wise counsel to *"get back to the business of teaching"*.

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APPENDIX A. Definitions and assumptions that underlie the perspectives in this paper.

Definitions

Learning – A change in behavior due to changes in the environment (Chance, 2014). In education, learning entails the acquisition and generalization of knowledge or skills due to instruction.

Curriculum – The knowledge and skills students are to learn and that teachers should teach (e.g., reading, math, science).

Instruction – The things teachers do to help students learn curriculum content. All instructional methods (i.e., teaching) entail changing the learner's environment.

Explicit instruction – Teaching characterized by clearly defined and measurable learning objectives; presentation of new material in small steps; frequent, active, and successful participation by all students that moves from guided to independent practice; systematic feedback and error correction; students' learning monitored by varied exercises (e.g., seatwork, homework); and systematic review of previous lessons.

Lesson – Planned period of instruction focused on at least one measurable learning objective.

Effective lesson (short term) - Students know something (e.g., who discovered the polio vaccine) and/or can do something (e.g., calculate the area of a circle) that they didn't know and/or couldn't do prior to the lesson (i.e., acquisition)

Effective lesson (long term) – Students use the knowledge and/or skills acquired in the lesson in relevant settings/situations at a later time (i.e., generalization and maintenance).

Assumptions

Students can and do learn without being taught, but effective instruction helps them learn more and retain it longer.

More learning is better than less. Of course it is, but *more* implies the use of objective measurement to discriminate more learning from less.

What teachers do (and don't do) influences student learning. Teachers' "actions have a direct and instructional influence on students' learning" (Carnine, Silbert, Kame'enui, & Tarver, 2010, p. 5) as do their failures to do certain things (e.g., not correcting students' errors).

Effective teachers focus on alterable variables. Benjamin Bloom (1980) called factors that both make a difference in student learning and can be affected by teaching practices *alterable variables*. Examples: The amount of time allocated for instruction; the sequence of activities within a lesson; the pacing of instruction; the frequency with which students actively respond during instruction; whether instructional materials require students to make a recognition or recall response; how and when students receive praise or other forms of reinforcement for their efforts; and the manner in which errors are corrected.

Explicit instruction is better than roundabout teaching. Roundabout teaching means trial-and-error learning, discovery learning, facilitated learning, or any other instructional approach in which students are to construct their own meanings from the lesson.

Effective teaching practices should be identified by function, not form. Instruction is effective to the extent students acquire and subsequently use knowledge and skills they did not have prior to instruction. Therefore, instructional practices should be judged first and foremost by the learning they produce. As Tom Lovitt reminded us, "The proof of the process is in the product." (1993, p. 567)