Instructional Practice Guide for Teaching Reading and Mathematics in Juvenile Correctional Schools[1]

Joseph C. Gagnon
Brian R. Barber

Please address correspondence regarding this article to Joseph C. Gagnon, Ph.D., University of Florida, 618 SW 12th Street, P.O. Box 117050 / 1420 Norman Hall, Gainesville, FL 32611-7050.

Abstract

Incarcerated youth commonly experience significant academic difficulty. In particular, these youth struggle in the areas of reading and mathematics. There are unfortunate limitations to the scope and quality of research on reading and mathematics instruction in juvenile corrections (JC). However, it is essential that teachers effectively and consistently utilize techniques that promote learning with these troubled youth. As such, the current article focuses on a description of: (a) the characteristics of incarcerated youth, (b) the current state of research, (c) effective and promising reading and mathematics instruction, and (d) future directions and resources.

U.S. educational reform continues to place progressively higher academic demands on youth (Maccini & Gagnon, 2006). Increased accountability and

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expectations that all students have access to a high-quality, grade-level curriculum are emphasized in the No Child Left Behind Act (NCLB; 2002) and the Individuals with Disabilities Education Improvement Act (IDEIA; 2004). Moreover, 43 states and the District of Columbia have adopted the rigorous Common Core State Standards (CCSS; 2014). NCLB (2002), IDEIA (2004), and CCSS (2012) are consistent in the recognition that research-based instructional approaches and adaptations are necessary to promote student access to and success in the general education curriculum. However, there are serious and longstanding concerns that juvenile correctional (JC) facilities are operating in a manner that is inconsistent with current educational reform and oversight mechanisms (Gagnon, 2010; Gagnon, Barber, Van Loan, & Leone, 2009; Gagnon, Haydon, & Maccini, 2010). Moreover, teachers of incarcerated youth are often isolated and do not have access to either typical district/local education agency in-service opportunities or training targeted to the unique situation in which they teach (Gagnon, Houchins, & Murphy, 2012). As such, it is important to provide practical information to educators concerning effective practice. In this practice guide, we first discuss the importance of effective instruction in the areas of English/language arts and mathematics in relation to the educational characteristics of incarcerated youth. We then provide information on the current state of research concerning English/language arts and mathematics in JC facilities. Next, we offer recommendations for instruction based on our current knowledge. Finally, we present a future direction and web links to relevant resources.

English/Language Arts, Mathematics, and Incarcerated Youth

English/language arts and mathematics are two critical academic areas that are represented in the CCSS (2010). Many researchers and advocates view English/language arts and mathematics as the cornerstone of a high-quality education. As Wilkerson, Gagnon, Mason-Williams, and Lane (2012) reported, illiteracy is related to youth problem behavior, exiting school without a diploma, incarceration, and recidivism (Archwamety & Katsiyannis, 2000; Katsiyannis & Archwamety, 1999; Jolivette, Stichter, Nelson, Scott, & Liaupsin, 2000; Kutner et al., 2007; Lembke, 2006; Snyder & Sickmund, 1999). Moreover, compared to adults with better reading skills, illiterate adults experience underemployment, receive lower wages, and have less stability in their employment (Kutner et al., 2007; McCracken & Murray, 2009). Similarly, experts view higher mathematics skills, such as those emphasized in middle and high school, as necessary for practically every career on today's job market (Moses & Cobb, 2001).

Unfortunately, certain secondary-age youth in our society are at significant risk for poor academic outcomes, particularly in the critical areas of English/language arts and mathematics. Specifically, incarcerated youth consistently perform below normally achieving peers in public schools (Gagnon & Barber, 2010). For example, incarcerated youth typically have serious problems with information processing and reading comprehension and do not read well enough to gain basic information from passages (Beebe & Mueller, 1993; Coulter, 2004; Krezmien, Mulcahy, & Leone, 2008; Wilkerson et al., 2012). Concerning mathematics achievement, youth in JC are typically behind peers by as many as four academic years (Baltodano, Harris, & Rutherford, 2005, Krezmien et al., 2008). As an illustration of this point, Zamora (2005) reported that although 86.6% of detained students were 7th through 10th graders, only one quarter of students had math and reading scores at middle and high school levels.

Disability classification is perhaps the most significant factor associated with the poor academic performance of incarcerated youth. In JC, approximately 40% of youth are classified with a disability (Gagnon et al., 2009) compared with only 9.1% of students in the general population (U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Programs, 2010). Moreover, in the general population of students, only 7.7% of youth with disabilities are classified with an emotional/behavioral disorder (EBD) and 45.5% with a learning disability (LD; U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Programs, 2010). In contrast, almost half of youth with a disability in JC are identified with an EBD and 38.6% with an LD (Quinn, Rutherford, Leone, Osher, & Poirier, 2005). Given that the special education classification in JC is about four times that of the general population, it is clear that a disproportionately high percentage of incarcerated youth have an EBD or an LD.

Youth with disabilities, in general, have serious academic difficulties and low performance on state assessments in reading and mathematics (Thurlow, Brenner, & Albus, 2011). In addition, on the National Assessment of Educational Progress (National Center for Education Statistics, 2013) scores for eighth-grade students revealed 79% of students without disabilities scored at or above the Basic level in mathematics, whereas only 35% of students with disabilities scored at this level. Similarly, 82% of students without disabilities and 40% of students with disabilities scored at or above the Basic level in reading. Youth with EBDs or LDs in particular have difficulties in English/language arts and mathematics. For example, in a review of literature, Reid, Gonzalez, Nordness, Trout, and Epstein (2004) reported that in 89% of reading studies and 92% of mathematics studies, students with EBDs performed below grade level. Similarly, youth with LDs score two standard deviations below the mean on standardized reading assessments (Lane, Carter, Pierson, & Glaeser, 2006) and commonly have mathematics deficits that affect academic success (Maccini, Mulcahy, & Wilson, 2007).

Current State of Research on Instruction in JC Facilities

Despite the importance of providing research-based English/language arts and mathematics instruction and instructional adaptations to youth in JC facilities, several factors inhibit the use of evidenced-based approaches. First, English/language arts research in JC facilities is limited to only reading instruction. Researchers and advocates note the importance of a broader research scope that includes English/language art (International Reading Association [IRA], 2012). Of specific note, the IRA (2012) identifies an emphasis on reading and writing in the content areas as an area of empirical need. Second, there is a disturbing lack of research within specific content areas and more generally across content areas within the JC setting. No research studies concerning mathematics instruction have been conducted in JC facilities. In the area of English/language arts, only a handful of studies exist in JC, and they relate solely to reading instruction (as opposed to content area reading and writing).

In the current brief, we address the realities of a limited research base in some ways that are important to note. First, we limit the discussion of English/language arts to reading studies completed in JC facilities, while we include research on mathematics instruction in other settings. An important acknowledgment is that, because of the lack of mathematics research in JC, we must rely on the assumption that effective instructional approaches can be applied to a variety of educational settings, from the most to the least restrictive (Maccini, Strickland, Gagnon, & Malmgren, 2008). Instructional approaches and adaptations may need to be adapted to the secure care setting (e.g., plastic vs. foam manipulatives in mathematics), but the fact that certain approaches are effective for students with LDs and EBDs, a group that is overrepresented in JC facilities, is ample justification for their application in JC. Moreover, there is support that the combination of instructional approaches noted below is also important to maximize student benefit (Maccini & Hughes, 2000; Maccini & Ruhl, 2000; Scheuermann, Deshler, & Schumaker, 2009). We also suppose that, for students in JC facilities, some instructional approaches to mathematics that are effective for youth with LDs are likely to also be appropriate for youth with EBDs (Gagnon, Wehby, Strong, & Falk, 2006). In addition to these groups of students having common learner characteristics in mathematics, more than half of youth with EBDs may also possess LDs (Reid et al., 2004).

Another important consideration is that teachers in juvenile corrections rarely use research-based instructional approaches in mathematics or reading (Maccini et al., 2008; Wilkerson et al., 2012). These researchers reported that teachers in JC facilities rarely use empirically validated approaches because of a lack of training or resources (particularly related to technology resources). Additionally, a common misperception among teachers in JC facilities is that some proven approaches are inappropriate for their students (Maccini, Gagnon, Cutting, & Leone, 2006). These issues point toward the vital need for teacher training. In fact, teachers of incarcerated youth are often isolated and excluded from staff development opportunities provided by the local school districts, regional education agencies, and state departments of education (Leone & Cutting, 2004). Although the purpose of this brief is not specifically to address issues of teacher training, this should be an important consideration whenever teachers are expected to implement instructional recommendations, such as those identified in the sections that follow.

Reading Instructional Approaches

Of the reading studies conducted in JC facilities, nearly all included at least some components of the Corrective Reading Program. The What Works Clearinghouse (U.S. Department of Education, 2007) defines the Corrective Reading program as being

> designed to promote reading accuracy (decoding), fluency, and comprehension skills of students in third grade or higher who are reading below their grade level. The program has four levels that address students' decoding skills and six levels that address students' comprehension skills. All lessons in the program are sequenced and scripted. Corrective Reading can be implemented in small groups of four to five students or in a whole-class format. Corrective Reading is intended to be taught in 45-minute lessons four to five times a week. (p. 1)

Based on the quality of studies reviewed by the U.S. Department of Education (2007) and the results reported, the evidence of effectiveness for Corrective Reading is small and no evidence exists in regards to reading comprehension. Nonetheless, it is the most studied reading intervention in JC facilities.

Malmgren and Leone (2000) used the Corrective Reading Program for 2 hours 50 minutes per day, 5 days a week for 6 weeks. The daily procedures included "1) direct instruction of both decoding and comprehension skills via the Corrective Reading curriculum; 2) whole language reading instruction comprised of reciprocal peer tutoring with an emphasis on student summarization and prediction; and 3) oral reading (i.e., "read-alouds") by the teacher" (Malmgren & Leone, 2000, p. 243).

It is noteworthy that 44.4% of students in the study were classified as needing special education, and of these, 8.5% were classified as having an EBD and 51% as having an LD. Students showed significant gains in reading rate (i.e., time in seconds it takes a student to complete a passage), accuracy (i.e., number of words the student reads incorrectly), and "passage" (i.e., Rate + Accuracy; Malmgren & Leone, 2000). The researchers reported no significant gains, however, in comprehension. It should be noted that researchers have concerns with the validity of the comprehension portion of the Gray Oral Reading Test (GORT; Wiederholt & Bryant, 1994) used in the study, because some questions are passage independent and can be answered without reading the passage (Keenan & Betjemann, 2006; Keenan, Betjemann, & Olson, 2008).

Drakeford (2002) evaluated the Corrective Reading Program with and without corrective feedback from the teacher. The intervention occurred for 60 minutes three times a week after school for a total of 8 weeks. All six participating students had a "history of educational disabilities, and/or had received special education services" (Drakeford, 2002, p. 140). The exact disability classifications, however, were not noted. Drakeford (2002) reported positive gains when using the program for all six participants in terms of reading fluency, student placement levels, and student attitudes toward reading.

Scarlato and Asahara (2004) evaluated the effect of Corrective Reading on nine 16- to 17-year-old incarcerated youth with an EBD or an LD. Youth who participated in Corrective Reading for 180 minutes of instruction a week while comparisons were provided with an "eclectic approach" (Scarlato & Asahara, 2004, p. 212) to reading instruction for 345 minutes a week. Both groups received 19 weeks of instruction. Students were assessed on the Word Identification, Word Attack, Word Comprehension, and Passage Comprehension Subtests, as well as Basic Skills, Reading Comprehension, and Total Reading Clusters for the Woodcock Reading Mastery Test–Revised (Woodcock, 1998). When comparing the treatment and control groups the authors noted that, on subtest scores, 60% of the Corrective Reading students and no students in the comparison group showed moderate or large gains. Similar trends existed for cluster scores, with 73% of treatment students and 27% of control students exhibiting moderate or large gains.

Houchins, Jolivette, Krezmien, and Baltodano (2008) conducted a study of reading interventions in three JC facilities. The percentage of youth with disabilities at the three facilities (accounting for attrition) was 46%, 31%, and 65%, respectively. Participants were commonly classified as having an EBD or an LD, with the second of the three facilities also having relatively equivalent percentages of youth with mental retardation and speech/language disabilities. In the first facility, the intervention occurred during a 2-hour break in the school day during lunch. At the second facility, the intervention was conducted after school. In the third facility, the intervention was implemented during a study hall the last period of the school day. Broadly, the reading interventions consisted of three components: (a) 30 minutes of decoding using Corrective Reading; (b) 10 minutes of fluency via paired reading; and (c) 20 minutes of instruction that included reading a passage orally, answering factual and inference questions, and discussing the main idea of the passage (Houchins et al., 2008). The researchers found the explicit instructional approach, even delivered for a short period, was effective for improving reading performance of treated students. Additionally, small (vs. large) group instruction was significant to students' improved word identification skills. However, Houchins et al. (2008) noted significant methodological limitations, including small sample size, limited dosage, and high attrition rates that should be considered when interpreting the results.

Coulter (2004) conducted a reading intervention with 12 incarcerated youth, including 5 with an EBD, 4 with a LD, and 1 with mental retardation. Although the researcher reported using Direct Instruction and Corrective Reading procedures, description of how the intervention aligned with the procedures was not provided. Broadly, the intervention included (a) identifying and dividing stories at an appropriate level, (b) preteaching (e.g., review reading and spelling word lists and assess student mastery), (c) oral reading with correction, (d) timed reading with graphing results, and (e) reviewing spelling words. Student scores on reading rate, accuracy, and comprehension generally improved; however, significant limitations existed in that the number of sessions experienced by students varied and that the data were not disaggregated by student disability type.

Allen-DeBoer, Malmgren, and Glass (2006) conducted a study of an individualized reading intervention with four adolescent incarcerated students with EBDs. The intervention, which was delivered 30 minutes daily for 9 weeks, focused on components of the Corrective Reading program: (a) 10 minutes of word attack wherein students sounded out words and phonemic letter sequences, (b) 15 minutes of the student reading aloud and responding to comprehension questions, and (c) completing an oral reading fluency probe (Allen-DeBoer et al., 2006). Posttreatment, students showed marked progress in oral reading fluency and a decreased number of oral reading error rates.

Two additional reading studies are worthy of brief mention. First, Hodges, Giuliotti, and Porpotage (1994) summarized data for several school reading programs. The authors did not provide sufficient information on the reading instruction that was provided to make conclusions on effectiveness. In another study of the computer-based FastForWord Literacy (and Advanced) program, Shippen, Morton, Flynt, Houchins, and Smitherman (2012) implemented the program focusing on student outcomes including "listening accuracy, phonological awareness, and understanding of language structures" (p. 16). The authors noted no significant gains due to the treatment.

Summary of Reading Research in JC

The available research concerning reading instruction in JC is unfortunately and severely limited by (a) a primary emphasis on the use of Corrective Reading, (b) methodological and analytical concerns, and (c) a dearth of studies generally. It appears that, broadly speaking, a direct instructional approach has some positive effects on youth reading rate, fluency, and accuracy of oral reading. Clearly, a great deal of research is still needed before it is possible to develop accurate assumptions about appropriate reading instruction for youth in JC facilities.

Mathematical Instructional Approaches

The mathematical instructional approaches are based on available information focusing on secondary youth with LDs and EBDs. Because of the limitations of the current literature, all research was conducted in settings other than JC facilities. Six approaches have research support in public schools, and our intent is to summarize these research-based instructional approaches for secondary students with LDs and EBDs in JC facilities. This is not an exhaustive review of the research; rather, practical approaches are reviewed that teachers can easily and effectively employ in the absence of mathematics instruction research specific to JC.

Explicit instruction/direct instruction (di) is defined as an approach to instruction that includes the following components: "(a) review, (b) presentation,

(c) guided practice, (d) corrections and feedback, (e) independent practice, and (f) weekly and monthly reviews" (Rosenshine and Stevens, 1986, as cited in Gagnon & Maccini, 2005, p. 2). Use of explicit instruction has consistently resulted in positive learning outcomes for secondary students with LDs in public school settings (Ozaki, Williams, & McLaughlin, 1996; Scarlato & Burr, 2002; Scheuermannet et al., 2009). In a recent meta-analysis, it was noted that interventions including explicit instruction produced significant positive effects for mathematical learning of students with learning difficulties (Gersten et al., 2009).

Strategy instruction is defined as teaching students to identify and implement "a plan that not only specifies the sequence of needed actions but also consists of critical guidelines and rules related to making effective decisions during a problem solving process" (Ellis & Lenz, 1996, p. 24). As Maccini and Gagnon (2005a) noted, effective strategies include use of memory devices such as (a) first-letter mnemonics and (b) simply stated strategy steps that are appropriately sequenced in relation to student actions, that promote student thought about the critical steps needed to solve a problem, and self-analysis of performance.

One approach to strategy instruction is the use of *mnemonic strategies*. Typically, a first-letter mnemonic strategy provides the steps that students will follow to solve a math problem (e.g., S—Search the word problem, T—Translate the words into a mathematical equation, A—Answer the problem, and R—Review the problem; Maccini et al., 2008). Secondary students with EBDs and LDs have benefitted from the use of mnemonic strategies in mathematics (Cade & Gunter, 2002; Manalo et al., 2000; Test & Ellis, 2005).

One other specific type of strategy instruction is *schema-based instruction*. Schema-based instruction includes assisting students in completing three steps to solve a mathematical word problem: (a) Identify problem type or appropriate schemas; (b) identify the key features of the word problem and represent the information in a diagram; and (c) solve the word problem via a process of planning, solving, and checking the reasonableness of the answer (Maccini et al., 2008). A schema-based approach has proved effective for youth with LDs (Jitendra, DiPipi, & Perron-Jones, 2002; Jitendra, Hoff, & Beck, 1999; Jitendra et al., 2009; Xin, Jitendra, & Deatline-Buchman, 2005).

Technology-based instruction and real-world problem solving are distinct approaches that are commonly combined. *Technology-based instruction* is defined as the use of computers and other types of equipment and programs (e.g., iPads, web-based learning) that support student learning (Maccini et al., 2008). *Real-world problem solving* is defined as "embedding problem solving information into real-world contexts" (Maccini et al., 2008, p. 19).

Although technology can be used for practice of simple mathematics facts, Bottge and colleagues (Bottge, 1999; Bottge, Heinrichs, Chan, & Serlin, 2001; Bottge, Heinrichs, Mehta, & Hung, 2002; Bottge, Rueda, LaRoque, Serlin, & Kwon, 2007; Bottge, Rueda, Serlin, Hung, & Kwon, 2007) have conducted the most relevant work in the area of technology and mathematics instruction that is applicable to secondary youth in JC. These researchers have integrated technology and real-world problem solving in an approach called "enhanced anchored instruction." This approach "uses a combination of multimedia-based problems delivered on a CD-ROM (called anchors) and related to hands-on projects (e.g., designing, building, and riding hovercrafts)" (Gagnon & Bottge, 2006, p. 41). These studies have documented positive effects resulting from the use of technology and real-world problem solving with secondary students identified as having an LD and an EBD in both general (inclusive) and alternative educational settings (although not specifically in JC).

Graduated instructional sequence is defined as a three-phase instructional sequence that includes concrete, semi-concrete, and abstract (CSA) representations (Maccini et al., 2007). Symbolic or abstract mathematical language issues, such as lacking conceptual understanding of the relationships between symbols and numbers, are met with instruction that (a) uses concrete manipulatives to represent concepts, (b) represents concepts using drawings, and (c) uses numerical representations (Gagnon et al., 2006). The CSA sequence has proved effective for students with LDs in a range of inclusionary and exclusionary classroom settings (Cass, Cates, Smith, & Jackson, 2003; Maccini & Hughes, 2000; Maccini & Ruhl, 2000; Scheuermann, Deshler, & Schumaker, 2009; Strickland & Maccini, 2012; Witzel, Mercer, & Miller, 2003). Results of a recent meta-analysis further confirm the positive effects of the graduated instructional sequence for middle school students who struggle with mathematics (Gersten et al., 2009).

Peer-mediated instruction is defined as "an instructional approach whereby students collaborate to achieve a common academic goal (i.e., cooperative learning) or instruction that is provided by peers, rather than adults" (Mulcahy & Gagnon, 2008, p. 15). Peer-mediated instruction has been associated with positive outcomes for students with LDs and EBDs in mathematics (Baker, Gersten, & Lee, 2002). Researchers have reported that peer-tutoring interventions are effective for teaching computations skills (Calhoon & Fuchs, 2003; Franca, Kerr, Reitz, & Lambert, 1990) as well as algebraic problem-solving skills (Allsopp, 1997). Although not solely focusing on peer collaboration, several of the aforementioned studies by Bottge and colleagues integrate a collaborative approach to solving anchored mathematics problems. It should be noted that, in some cases, peer-mediated approaches are equal to but not more beneficial than other approaches. Benefits of peer-mediated instruction include the development of student pro-social skills, as well as an opportunity for lower student–teacher ratios affording "individualized instruction, continual or frequent response monitoring, error correction, and reinforcement" (Mulcahy & Gagnon, 2008, p. 15).

Instructional adaptations are classified into three major types: *self-monitoring*, *graphic organizers*, and *cue cards* (Maccini et al., 2008). Maccini and colleagues defined *self-monitoring* of academic tasks as methods designed to assist students in tracking their completed work. One effective self-monitoring approach is for students to self-monitor completing appropriate procedures to solving a mathematical problem (Maccini & Hughes, 2000; Maccini & Ruhl, 2000; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999). *Graphic organizers* are "diagrammatic illustrations used to organize and highlight key content information and/or vocabulary" (Maccini & Gagnon, 2005b, p. 2), as well as the connecting links. Graphic organizers are effective in assisting students with mathematical LD, particularly to solve linear equations (Ives, 2007). *Cue cards* provide students guidance concerning the steps that need to be followed to complete mathematical problems. In addition to Maccini and colleagues (Maccini & Hughes, 2000; Maccini & Ruhl, 2000), who have effectively integrated cue cards into interventions, other researchers have also reported positive student gains when using cue cards with secondary students with LDs (Butler, Miller, Crehan, Babbitt, & Pierce, 2003; Franca et al., 1990; Joseph & Hunter, 2001).

Future Directions

Mathematics Instruction

Perhaps the single most important next step for ensuring appropriate mathematics instruction in JC facilities is for researchers to actually conduct research in this school setting. As noted, no studies have evaluated mathematics instruction within JC schools. It is likely that instructional approaches that are effective in other settings will also be effective in JC facilities. There are concerns, however, that considerations such as security issues will require the appropriate adaptation of approaches and materials within secure care (Maccini et al., 2008).

Reading Instruction

Research does exist that focuses on effective reading instruction in JC facilities. A problematic focus on use of Corrective Reading, however, is apparent in almost all studies. Minimal evidence for the effectiveness of Corrective Reading exists, and therefore research is needed on other, more promising programs (U.S. Department of Education, 2007). For example, Slavin, Cheung, Groff, and Lake (2008) reviewed more than 200 studies and reported moderate evidence for the effectiveness of four reading programs: Jostens, The Reading Edge, READ 180, and Student Team Reading. In addition to the narrow focus on Corrective Reading, there is concern regarding methodological flaws of reading research conducted in JC facilities. Although there are obvious significant difficulties with conducting research in a secure care setting (Mulcahy, Leone, Krezmien, Houchins, & Baltodano, 2008), researchers must continue to strive to conduct high-quality research in this setting. Finally, it is important to expand the research on reading in JC facilities to include English/language arts, particularly as integrated in the content areas (IRA, 2012).

Recommended Websites

American Institutes for Research: http://www.air.org (mathematics, reading)

LD Online: http://www.ldonline.org/index.php (mathematics, reading)

What Works Clearinghouse: http://ies.ed.gov/ncee/wwc/ (mathematics, reading)

National Council of Teachers of Mathematics: http://www.nctm.org/ (mathematics)

Common Core State Standards Initiative: http://www.corestandards.org/ (mathematics, reading)

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Biographical Sketches

JOSEPH CALVIN GAGNON, Ph.D., is an Associate Professor at the University of Florida. Dr. Gagnon's research focuses on focuses on ensuring that youth at the greatest risk for educational, social, and behavioral failure are provided the supports necessary for long-term success in school and society.

BRIAN R. BARBER, Ph.D., is an assistant professor at Kent State University. Dr. Barber's research focuses on the development and implementation of effective interventions for children and youth with emotional and behavioral difficulties and disorders.