Building Science Reading Fluency for Students with Disabilities with Repeated Reading to a Fluency Criterion

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The current study investigated the effects of repeated readings to a fluency criterion with science text for seven students with disabilities using multiple probe multiple baselines across participants. Results indicated students met criteria on four consecutive passages. As shown on Standard Celeration Charts a majority of students' correct words per minute accelerated while incorrect words per minute decelerated on successive initial, intervention readings demonstrating reading transfer. Students' reading scores during post-test and maintenance out performed pre-test and baseline readings providing additional measures of reading transfer. The study also suggested a relationship with comprehension; students scored higher on oral retell measures after meeting criterion when compared to initial readings. Overall, repeated readings to a fluency criterion intervention improved science reading fluency for students with disabilities.

In 1996, the National Research Council published a document entitled *National Education Science Standards* and with a sentence summarized their intent: *Science standards for all students (An Overview, paragraph 4)*. Currently, 90% of schools maintain the same science standards for all students (U.S. Department of Education, 2006) however; the gains for students with disabilities fall well behind their nondisabled peers. In 2005, an average of 30% of students with disabilities in the 4th, 8th, and 12th grades scored at or above basic proficiency in science compared to an average of 60% of same-aged students without disabilities (Grigg, Lauko, & Brockway, 2006).

Students with disabilities often do not experience the same academic success as those without disabilities. Yet the discrepancy in science may pose an even greater problem. The Individuals with Disabilities Education Act [IDEA] (U.S. Department of Education, 2006) reports that 80% of secondary students with high incidence disabilities (e.g., specific learning disabilities, emotional disturbance) take science with two-thirds receiving instruction in a general education setting. Therefore, many students with disabilities perform well below their peers in science *and* receive instruction in the same setting with the same standards.

Modifications, Accommodations, and Science Education Reform

To aid students with disabilities, 65% receive some form of modification in academic areas (U.S. Department of Education, 2006). Some modifications to science instruction include oral instead of written answers (Cawley & Parmar, 2001), changes to instructional materials (Ormsbee & Finson, 2000), and adaptations to textbooks in the form of study guides (Horton & Lovitt, 1989) and/or graphic organizers (Bergerud,

Lovitt, & Horton, 1988). Additionally, direct (McCleery & Tindal, 1999), strategy (Guastello, Beasley, & Sinatra, 2000; Smith, Dittmer, & Skinner, 2002), and mnemonic instruction (King-Sears, Mercer, & Sindelar, 1992; Mastropieri, Scruggs, McLoone, & Levin, 1985; Mastropieri, Scruggs, & Levin, 1986; Scruggs, Mastropieri, Levin, & Gaffney, 1985) have helped students with disabilities in science. Finally, some have suggested using technology or augmentative devices such as a television (Williams & Hounshell, 1998), computer (Kumar & Wilson, 1997), or communication device (Davies, 1994).

Science instruction modifications and adaptations serve a dual purpose, not only addressing difficult science content, but also attending to the documented difficulties students with disabilities have with reading (U.S. Department of Education, 2006). Teachers using science textbooks as the instructional medium presuppose that students can proficiently interact with the material (Cawley, Foley, & Miller, 2003). Science textbooks oftentimes read at a higher grade level than stated and contain information in a disorganized fashion (Ofiesh, 2007), while students with learning disabilities traditionally have difficulties with decoding and comprehension (Lynch, 2007). Such a combination hinders a student's ability to improve conceptual science understanding (Cawley & Parmar, 2001; Parmar, Deluca, & Janczak, 1994; Woodward, 1994). Despite reading deficits, students with disabilities must still have opportunities to learn and display science knowledge (Cawley & Parmar, 2001).

To address the problem of science instruction for students with disabilities many researchers (e.g., Cawley & Parmar, 2001; Grumbine & Alden, 2006; Williams & Hounshell, 1998) recommend reforming science education (see AAAS, 2008; NSF, 2005; Rutherford & Ahlgren, 1990). One proposal advocates teachers shifting from textbook-based toward inquiry- and activity-based science instruction.

Inquiry- and activity-based classrooms actively engage students during instruction thus increasing opportunities for participation in discussions and other group-orientated activities (Freeman & Taylor, 2006; Le, et al., 2006). Through multiple avenues, students purportedly connect information across subjects, relate new experiences to previous experiences, and further develop conceptual, rather than factual, scientific understanding (Champagne, Newell, & Goodnough, 1996; Freeman & Taylor; 2006; Fox, Grosso, & Tashlik, 2004; McKee & Ogle, 2005). Therefore, language-based (e.g. activity- or inquiry-based) interventions and accommodations provide a way for students with disabilities to interact with, learn, and display science knowledge minimizing the effect of reading deficits (Cawley & Parmer, 2001; Rivard, 2004).

To one degree or another, many of the science modifications, adaptations, and reforms have students with disabilities spending less time engaged in decoding and comprehension of science text. Nevertheless, reading plays a crucial role in science (Deshler, et al.; 2001). The ability to read competently helps continue the scientific process (e.g., communication of scientific knowledge) and allows students to integrate science with literature enhancing scientific literacy (Freeman & Taylor, 2006; McKee & Ogle, 2005). A student's ability to read fluently sets the stage for their comprehension in content-areas such as science (Bhattacharya, 2006).

Reading Fluency and Repeated Readings

Reading fluency has ties to overall reading ability (Fuchs, Fuchs, Hosp, & Jenkins, 2001; Shinn & Good, 1992), serves as an access point to reading comprehension (Therrien, 2004), and influences content area success (Bhattacharya, 2006). While research shows a number of methods that promote reading fluency, repeated readings has emerged as one of the most effective fluency-building procedures for students with disabilities (Chard, Vaughn, & Tyler, 2002; Kuhn & Stahl, 2003; Meyer & Felton, 1999). Research (Chard, et al., (2002); Kuhn & Stahl, (2003); Meyer & Felton, 1999) has shown repeated readings benefits with narrative text, but rarely examined the effect of repeated readings in science which consist mostly of expository text. The two types of text contain differences. Expository text has a greater extent of difficult vocabulary, a more straightforward presentation of information and concepts, and content that students may not readily understand (Carnine, Silbert, Kame'enui, & Tarver, 2004).

Specifically, two studies (Ellis & Graves, 1990; Heibert, 2005) examined the effect of repeated readings in science. Rather than focusing on reading fluency, Ellis and Graves compared repeated readings to a paraphrasing strategy to locate the main idea within a science passage for 47 students with learning disabilities. Students found more main ideas with the paraphrasing strategy as compared to repeated readings and a combination of both.

On the other hand, Heibert (2005) employed repeated readings to examine reading fluency across literature text, content (i.e., science) text, and a control group for 115 students without disabilities from three separate schools. Students reread passages a minimum of three times in a variety of formats (i.e., teacher modeled reading, echoic reading with the teacher, peer rereading, or choral reading). Students across groups did not receive similar amounts of opportunities to reread, reading instruction, and error correction. Average reading rates (and standard deviations) for students reading science passages improved from 33 (*SD*=35) to 66 (*SD*=32) words per minute, the largest average increase of the three groups.

Given the importance of oral reading fluency for content area success and the limited reading fluency research conducted with science text, a specific model of repeated readings may provide a well suited method for science: repeated readings to a fluency criterion. Repeated readings to a fluency criterion compared to other models of repeated readings contain many similar aspects such as multiple readings through the same passage (e.g., Staubitz, Cartledge, Yurick, & Lo, 2005; Therrien & Kubina, 2007), error correction (e.g., Martens, et al., 2007; Yurick, Robinson, Cartledge, Yo, & Evans, 2006), and feedback (e.g., Sweeney, Ring, Malanga & Lambert, 2003). The distinguishing feature between models remains the use of a static reading criterion a student must reach before moving to the next practice passage.

Initial reading fluency criteria arose from Samuels (1979) and Dahl (1974) ranging from 85-100 words per minute. Researchers also employed criteria based on reading or grade level norms, ranging from 30-180 correct words per minute (e.g., Carroll, McCormick, & Cooper, 1991; Mercer, Campbell, Miller, Mercer, & Lane, 2000; Staubitz , 2005; Therrien & Kubina, 2007; Therrien, Wickstrom, & Jones, 2006; Weinstein & Cooke, 1992; Yurick, et al., 2006) or in consultation with teachers, parents, or students ranging from 75-200 correct words per minute (e.g., Anderson & Alber, 2003; Martens , et al., 2007; Polk & Miller, 1994; Spence, 2002; Tam, Heward, & Heng, 2006). Another group of researchers (e.g., Kostewicz, & Kubina, 2010; Kubina, Amato, Schwilk & Therrien, 2008; McDowell, McIntyre, Owen & Keenan, 1998; Sweeney et al., 2003; Teigen, Malanga & Sweeney, 2001) based criteria from the behavioral fluency literature which suggested ranges from 180-210. A few studies included criteria limiting the number of errors (e.g., Carroll et al.,1991; Kubina et al., 2008) while others counted words per minute (e.g., Staubitz , et al., 2005; Yurick et al., 2006) rather than correct words per minute. Not surprisingly, students reading to a fluency criterion demonstrated the ability to meet the different reading criteria (e.g., Staubitz , et al., 2005; Yurick, et al., 2006), showed reading transfer (e.g., Kostewicz & Kubina; 2010; Samuels, 1979), and exhibited long-term retention (e.g., Kubina et al., 2008).

Purpose and Research Questions

Previous repeated reading studies using science material (Ellis & Graves, 1990; Heibert, 2005) did not include a fluency criterion and either included students without disabilities (Heibert, 2005) or did not measure a reading fluency outcome (Ellis & Graves, 1990). Given that many classrooms continue to use textbooks as the primary mode of instruction and students with disabilities must still have access to science (Cawley & Parmar, 2001; Williams & Hounshell, 1998), improving the reading fluency of students with disabilities contributes to future successful outcomes within and outside of science class. Therefore, this study investigated the effects of repeated readings to a fluency criterion on reading fluency with science text for students with disabilities. As measures of reading transfer (Faulkner & Levy, 1994; Samuels, 1979) and an indicator of reading comprehension (Roberts, Good, & Corcoran, 2005), specific questions include:

1. What effect will reaching a fluency criterion on one passage have on initial, unpracticed readings of successive passages?
2. Will reaching a fluency criterion on one passage impact the number of sessions necessary to reach fluency on successive passages?
3. If students reach the fluency criterion on passages from one chapter would that affect performance on initial, unpracticed readings from another chapter?
4. What effect will reaching fluency on a passage have on students' ability to retell what they read in that passage?

Methods

Participants and Setting

Seven students (Table 1) from a public middle school in a medium-sized, suburban city participated in the current study. All students previously received special education designations based on federal definitions of each disability category (i.e., SLD and SED) and spent part of the school day in a learning support classroom which served a variety of functions (e.g., Direct Instruction reading and language instruction, essay writing, poem writing, study skills). Based on nominations from the learning support teacher, all students needed assistance reading science material. Furthermore, all students had reading goals on their respective Individualized Education Plans, received science content in another setting (i.e., general education), and had parental permission to participate. No student had experience with systematic repeated readings, but all had experience with timed readings. All interventions took place in the hallway outside of the classroom in one-on-one formats with the experimenter or trained data collectors and each student.

Materials

Study readings came from the science textbook *From Bacteria to Plants* (Padilla, Miaoulis, & Cyr, 2007) and based on Fry readability procedures (Fry, 1989) had a seventh grade readability score. The experimenter chose two separate chapters, chapter one, *Living Things*, and chapter four, *Introduction of Plants*, and typed approximately the first 2,400 words of each chapter verbatim. Transcribed text included only the main body of the text, including headings and subheadings with any bolded or italicized print removed. Typed copies

Table 1

Student Demographic and Group Assignment Data

Student	Age	Gender	Ethnicity	Grade	Special Need Classification	Assessment Score (CWPM/IWPM)	Assigned Group*
Denise	12	F	A	7	SLD	91/11	A
Nancy	12	F	C	7	SLD and ADD	76/11	A
Joseph	12	M	C	7	SLD	64/8	A
Jason	13	M	C	7	SLD	100/15	A
Ned	12	M	C	7	SLD	79/7	B
Kevin	13	M	C	7	SED	92/3	B
Elise	13	F	C	8	SLD	98/16	B

Note. F = Female; M = Male; A = African American; C = Caucasian; SLD = Specific learning disability; SED = Serious emotional disturbance; ADD = Attention deficit disorder; CWPM = Correct Words per Minute; IWPM = Incorrect Words per Minute;
*Group A received chapter one readings and Group B received chapter four readings.

did not include any other text (e.g., pronunciations, text from figures, figure captions, reviews, study guides).

Once copied verbatim, the experimenter divided each chapter into 12 smaller passages containing a minimum 200 words (range 200-215) with each finishing at the conclusion of a sentence. Passage 1 for both chapters comprised the first 200+ words; passage 2 the second 200+ words, and so on until reaching passage 12. Three additional passages from chapter one required for an extended baseline for one student raised the total to 27 passages.

The experimenter conducted two forms of analysis on each group of passages: passage readability and word overlap. The experimenter used the Microsoft Word tool feature to determine Flesch-Kincaid readability and Flesch reading ease scores (c.f. Flesch, n.d.) for each of the 27 passages. Chapter one passages had an average grade level readability of 9.6 (range, 6.9-11.6) and a reading ease of 49.2 (range, 35.4-64.0). Chapter four passages had an average grade level readability of 8.4 (range, 7.0-10.6) and a reading ease score of 57.1 (range, 43.1-69.2). The second analysis determined word overlap between passages for each chapter. The experimenter calculated number of identical words and number of times those words overlapped for each pair of passages. Chapter one had an average word overlap between passages of 27.74% (range, 19%-46%) and chapter four had an average word overlap of 28.19% (range, 21%-45%).

Additional materials included copies of each passage for the experimenter and participants, a countdown timer, No. 2 pencils, and a video recorder (i.e., JVC Everio hard disk camcorder), tripod, and age-appropriate participation prizes (e.g., pencils, pens, folders, erasers). Passage copies for the experimenter had a running total of words at the end of each row and a table to score oral retells. Passage copies for participants had no word count or numbered table.

Dependent Variables

The measurement of three dependent variables showed the effects of the intervention. Correct words per minute, the first dependent variable included words pronounced correctly within three seconds in their proper place in the text (Shinn, 1989). Self-corrections also counted as correct. Incorrect words per minute, the second dependent variable, included omissions, substitutions, mispronunciations, and words not read within three seconds (Shinn, 1989). Inserting words into text also counted as incorrect. If participants skipped entire lines of text, those words did not count as correct or incorrect. Calculation of corrects involved subtracting incorrects from total words read in one-minute with any insertion errors added to the incorrect total only.

The third dependent variable, oral retell fluency, consisted of the number of words correctly recalled relating to a particular reading in one minute assessment period. Each of the words had to refer back to the original reading. The ex-

perimenter based oral retell scoring procedures on those found in the *Dynamic Indicators of Basic Early Literacy Skills*^{TM} (6th ed.) (c.f. Good & Kaminski, 2007). The experimenter administered an oral retell test immediately following each initial, unpracticed reading of a repeated reading passage, and directly after each student reached the fluency criteria for the passage. The experimenter transcribed each retell verbatim from video recordings and then scored the retell per scoring procedures.

Independent Variable

Repeated Readings to a Fluency Criterion Condition

In the repeated readings to a fluency criterion (RRFC) condition, the student read one of the RRFC passages for one minute, three times each session. The experimenter provided the student with an unmarked copy of the passage and told the student that they would read the passage three times for one minute each as fast as possible and to return to the start of the passage if reaching the end. Timed for 60 seconds, the student started reading from the first word of the passage. As the student read the experimenter maintained a count of any incorrects on the experimenter's copy of the passage. After 60 seconds the timer beeped and the experimenter prompted the student to stop reading and provided the student feedback in the form of number of correct and incorrect words. Error correction consisted of a model-lead-test procedure for all incorrects (Carnine et al., 2004). Every word mispronounced, omitted, substituted, skipped, or hesitated on for more than three seconds received error correction. The student had to pronounce each word properly after hearing a model. To correct insertions, students listened to the pronunciation of the words occurring just before and after the inserted word. After hearing these words, the student had to pronounce both words properly.

Experimental Design

To show repeated readings to a fluency criterion effects on science textbook passages, the experimenter used two multiple-probe multiple baselines across students, one for each of the two groups of students (Horner & Baer, 1978; Kennedy, 2005). The design and the Standard Celeration Charts (Graf & Lindsley, 2002; Pennypacker, Gutierrez, & Lindsley, 2003), allow the comparison of celerations of initial, unpracticed readings for each student from baseline to intervention and a comparison of celerations of RRFC passages for each student (c.f., Pennypacker et al., for a discussion of celeration). As some students remained in baseline for an extended period, multiple probes of readings, rather than daily readings, minimized reading practice effects while still showing reading score celerations.

Procedures

Assessment/Pretest Reading

To start the study, all students individually read one passage taken from chapter three for one minute. The passage consisted of 221 words, 9.4 readability, 56.4 reading ease score, and an average word overlap of 27.95% with chapter one passages and 28.01% with chapter four readings. All seven students met inclusion criteria by reading between 50 and 150 correct words per minute placing them within an instructional reading range (Kubina & Starlin, 2003). The experimenter assigned students to group A or B based on approximate matching of assessment/pretest scores. Table 1 displays assessment/pretest scores and group assignment.

General Procedures

Figure 1 presents a flow chart that follows the procedures for one group of students although both groups A and B followed identical procedures. Students read three baseline passages each for one minute with feedback only (A). A student displaying a stable or decelerating trend entered intervention with the first RRFC passage (B1). The other students received one baseline reading probe three sessions later (B2). If no student displayed a stable or decelerating baseline, remaining students continued to read one baseline passage per session (B3). The baseline probe or reading process continued until all students started the intervention.

When starting the intervention (or any initial readings of a RRFC passage) each student read one minute with feedback and completed an oral retell pre-test (C). During successive sessions, students followed the aforementioned RRFC procedures of three one-minute readings of the passage each followed by error correction and feedback (D). A test reading for one-minute with feedback only followed the third re-read (E). Students meeting criterion (200+ CWPM with 2 or fewer IWPM) immediately took part in an oral retell post-test (Fa) and advanced one RRFC passage during the next session (i.e., following day) (Fb). Students not meeting criterion read the same passage during the next session (i.e., following day) three more times for one-minute with error correction and feedback followed by another test reading (D). Each student followed all steps until meeting criterion on the four pre-determined RRFC passages (G).

Students followed the same procedures during the final six sessions (i.e., days): one one-minute reading with feedback only. The experimenter first presented one more unpracticed reading from the assigned chapter (H). During the next session, all students regardless of group read a post-test (I). As a measure of transfer, students read the four RRFC passages, one per session (J), from the other group (i.e., Group A read Group B RRFC passages and vice versa). Once completing the final transfer reading, students completed the study.
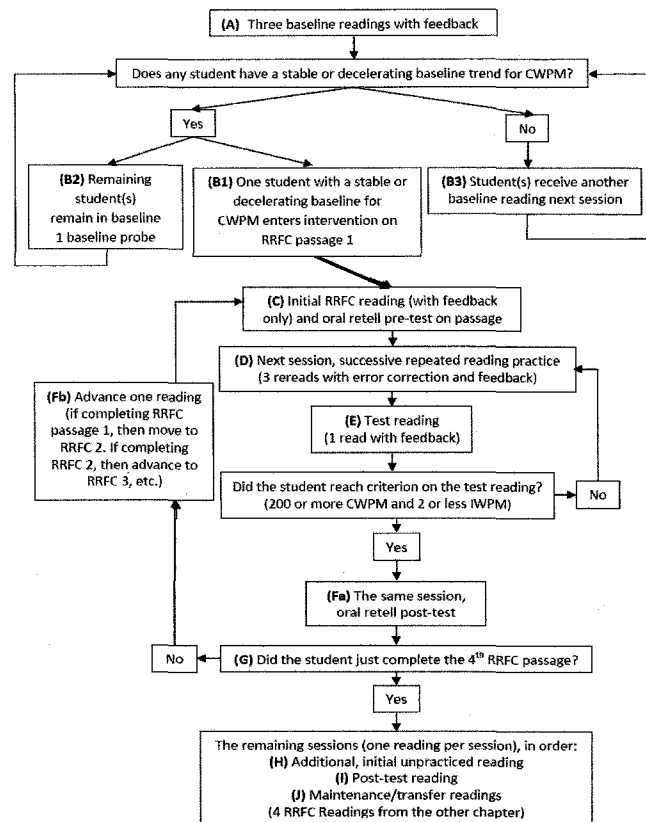
Accuracy, Inter-observer Agreement, and Procedural Integrity

Because each session had a paired video recording (i.e., permanent product), the experimenter examined each video to determine accuracy, or *the extent to which observed values approximate the true state of nature* (Johntson & Pennypacker, 2009, p. 363) of each student's reading. The experimenter used the accuracy scores on each student's test reading score and equaled 100% for CWPM and IWPM.

Two trained data collectors implemented the procedures during one session and completed inter-observer agreement on oral retells and procedural integrity. To verify oral retell scores, a trained data collector verified 20% of the oral retell test transcriptions from video. She then scored those particular retell transcripts. To calculate retell scoring agreement, the experimenter used a total agreement approach (Kennedy, 2005). To calculate total agreement per observation, the experimenter divided the larger number of correct words by the

Figure 1

The current figure illustrates the general procedures in a flow chart format. Both groups followed identical procedures throughout the study. Note. CWPM = Correct words per minute, RRFC = Repeated reading to a fluency criterion, IWPM = Incorrect words per minute.

smaller amount of correct words. Average total agreement for oral retells equaled 90%. The same data collector, who calculated oral retell agreement, performed procedural integrity on 20% of the sessions. To calculate procedural integrity, the observer reviewed each identified session and completed experimenter-created checklists verifying the specific steps of the procedure. Percent of steps completed correctly totaled 99%.

Social Validity

To measure social validity, the experimenter used three distinct measures. First, students and teachers completed a questionnaire at the conclusion of the study targeting their involvement in the study. While taped, students verbally responded to three questions: 1) Did you enjoy participating in this study? Why or why not, 2) Do you feel this procedure helped you with your science text? and 3) Do you feel you understood what you read better? The teacher responded with written answers to four questions: 1) Did you feel that your students benefited from their participation? 2) Did you notice anything different about your students as a group as they progressed through the study? If yes, could you elaborate briefly? 3) Did you notice anything notable about any particular student(s)? 4) If possible, would you try this procedure with students? Second, the students also anonymously completed 10 questions on a 5-point Likert scale after returning to the classroom to minimize any observer effects. The classroom teacher answered any questions students had with regards to the questionnaire.

Results

Group and Individual Pre- and Post-test Reading Scores

Table 2 displays the pre- and post-test scores for all students. Students participated in a pre-test/assessment reading during the first session and a post-test reading after the extra reading session. Students' mean correct words per minute (CWPM) increased from 85.7 to 93.8 and mean incorrect words per minute (IWPM) decreased from 10.1 to 6.8. Student reading accuracy improved from 90.0% to 93.2% on average. Six of seven students improved CWPM and all students made the same or fewer IWPM. Six students improved with one maintaining reading accuracy. Group A students improved reading accuracy more than Group B from pre- to post-test, while Group B had a higher mean accuracy score.

Group and Individual Reading Scores

Figures 2 and 3 illustrate reading scores for students reading chapter one (Group A) and chapter four passages (Group B) in a multiple baseline format. All of the data appear on Standard Celeration Charts (SCC). The SCCs show proportional behavior change, normalize variability, display learning as a straight line, accurately depict outliers, place behavior in

real time, and allow the calculation of celeration, a quantitative measure of learning (Graf & Lindsley, 2002; Kubina & Lin, 2010; Lindsley, 2005; McGreevy, 1983; Pennypacker, et al., 2003).

On all of the SCCs dots represent CWPM and X's represent IWPM. Both figures have logarithmically scaled vertical axes and equal interval scaled horizontal axes which correspond to calendar days. The dotted vertical line signifies the start of intervention and solid vertical lines show each phase change (e.g., new passages during intervention). The abbreviations refer to baseline, repeated reading 1-4 (RR1-RR4), the extra reading (*), and maintenance/transfer readings (M/T). Dotted horizontal lines at 200 and 2 each signify the criterion reading levels for CWPM and IWPM. When displayed, celeration lines lie on specific data path and can reveal accelerating (x or multiply sign) or decelerating (÷ or divide sign) behavior. Celerations or *the frequency of responding for a particular time unit divided by unit time* (Kennedy, 2005, p. 90) provide a quantification of the change in behavior frequency. For example, a behavior that has a x2.00 celeration means that the behavior has doubled in a week.

Standard Celeration Charts and the subsequent display of the data via celerations provide advantages teachers and researchers may wish to consider. For instance, celerations show the change in the celeration or rate of behaviors over time and not simply absolute change from session to session (Johnson & Pennypacker, 2009). Additionally, a SCC can display multiple behaviors (e.g., CWPM and IWPM) on the same graph to allow rate of change comparisons via multiple celerations. An important discovery of Standard Celeration Charted behavior established the independence of behavior (Lindsley, 2005). Namely, celeration changes in CWPM, for example, do not guarantee celeration changes in IWPM. Students with accelerating CWPM may have concomitant IWPM accelerations or vice versa. Celerations accurately reflect reading performance over time and also capture important, fine-grained comparisons.

Two particular features of each student's reading scores directly reflect the effects of the repeated reading intervention. First, each student's initial reading was with a new passage. Each student had four celeration lines; correct and incorrect celerations for both pre- and post-intervention readings created using the quarter intersect method (Pennypacker, et al., 2003). Pre-intervention readings include all baseline reading scores. Post-intervention readings combined the initial reading scores from intervention passages with the extra reading score. The second feature of each group's results comes out of the per-passage sessions to criterion.

Group A: Pre- and post-intervention celerations. **Figure 2** shows the reading scores for Jason, Joseph, Denise, and Nancy. Prior to intervention, three students had decelerating CWPM with one student showing a modest acceleration. Jason, Joseph, and Denise had decelerations of ÷1.32, ÷1.43, and

÷1.10 while Nancy's reading frequency accelerated by x1.28. For IWPM, Jason had a ÷1.58, Joseph, ÷1.15, and Denise, ÷1.05, while Nancy showed an acceleration of x1.10. After intervention, all four students had accelerations for CWPM on post-intervention initial readings. Consequently, Jason, Joseph, Denise, and Nancy had accelerations of x1.03, x1.10, x1.05, and x1.09. Joseph and Denise had decelerations for IWPM of ÷1.18 and ÷1.15, while Jason maintained his IWPM with an x1.0 celeration and Nancy's accelerated by x1.10.

The celeration change equation (Pennypacker et al., 2003) permits the calculation of celeration comparisons. Celeration change quantifies the behavior change as a result of intervention. For example, a student's correct responding may change from a decelerating pattern in one phase to an accelerating pattern in the next. The change from deceleration to acceleration shows the celeration change. A multiplier or divider number for the celeration change constitutes the vertical distance of change that occurred between the two celerations in each phase.

Figure 2 shows Joseph and Denise's celeration changes for CWPM, x1.57 and x1.16, and IWPM, ÷1.03 and ÷1.10.

Stated differently, the repeated reading intervention positively impacted the celeration of reading new passages for Joseph and Denise; each student read more words correctly as a result of the intervention and also made few errors or had better accuracy when reading. Jason had an improving celeration change for CWPM, x1.36 but worsened with his IWPM, x1.58. Nancy's CWPM celeration multiplier of ÷1.17 means her growth across the repeated reading intervention slowed. Her IWPM celeration change of x1.00 means the celerations remained the same.

Group B: Pre- and post-intervention celerations. Figure 3 shows reading scores of novel passages for Ned, Kevin, and Elise. Ned and Kevin had pre-intervention decelerations of ÷1.35 and ÷1.05, for CWPM and accelerations for IWPM of x1.28 and x1.38. Elise had accelerations for CWPM, x1.00, and IWPM, x1.12. Ned, Kevin, and Elise had decelerations of, ÷1.08, ÷1.02, and ÷1.08, for CWPM post-intervention. For IWPM post-intervention, Kevin and Elise had accelerations of x1.10 and x1.00 and Ned had a deceleration of ÷1.15. Ned and Kevin had improving celeration changes for both CWPM, x1.25 and x1.03, and IWPM, ÷1.47 and ÷1.25, from pre- to

Table 2

Pre- and Post-test Readings

Student	Pre-Test			Post-Test		
	Corrects	Errors	Accuracy	Corrects	Errors	Accuracy
Group A						
Jason	100	15	87%	101	11	90%
Joseph	64	8	89%	68	4	94%
Denise	91	11	89%	113	8	93%
Nancy	76	11	87%	92	5	95%
Group Average	82.8	11.3	88%	93.5	7	93%
Group B						
Ned	79	7	92%	77	4	95%
Kevin	92	3	97%	97	3	97%
Elise	98	16	86%	108	13	89%
Group Average	89.7	8.7	92%	94.0	6.7	94%
Overall Average	85.7	10.1	89.6%	93.8	6.8	93.3%

post-intervention. Elizabeth, while showing improving celeration changes for IWPM, ÷1.12, had a worsening CWPM celeration change, ÷1.08.

Group A: Intervention passage reading. Students read four passages to criterion during the course of the study (Figure 2). Following an initial one-minute reading, each session consisted of four minutes of reading (i.e., number of dots in each phase minus the initial reading equal the number of sessions to criterion). No student from Group A decreased the number of sessions to criterion across the four passages. Jason (10 to 9 and 10 to 9) and Joseph (9 to 8 and 9 to 8) showed decreases from passages RR1-RR2 and RR3-RR4 but an increase (Jason, 9 to 10; Joseph, 9 to 10) from passages RR2-RR3. Similarly, Denise (7 to 8 and 8 to 9) and Nancy (3 to 4 and 4 to 5) required more sessions to reach criterion on passages RR1-RR2 and RR2-RR3. However, both required fewer sessions from RR3-RR4 (Denise, 9 to 6; Nancy, 6 to 4). Nancy required the fewest sessions (3 or 13 minutes of reading) to reach criterion on a passage and Joseph required the most (10 sessions or 41 minutes of reading).

Group B: Intervention passage reading. Like Group A,

no student from Group B required successively fewer passages to reach criterion (Figure 3). Ned (9 to 5) and Elise (9 to 8) showed decreases from RR1-RR2 with Ned (10 to 11) requiring one additional session. The transition from passages RR2-RR3 also decreased for both Kevin (11 to 4) and Elise (8 to 4) while Ned needed the same amount of sessions to reach criterion (5 to 5). All three students Ned, 5 to 9; Kevin, 4 to 14; Elise, 4 to 8, engaged in additional practice sessions to reach criterion on the final passage (RR4) as compared to RR3. Kevin spent the most time (14 or 57 minutes) reaching criterion on a passage, while Elise required the fewest (4 or 17 minutes).

Maintenance/Transfer Measures

The final four readings by each student (Figures 2 and 3) provided a measure of maintenance/transfer. Students who received intervention using passages from one chapter read the intervention passages (RR1-4) from the other chapter for one-minute. To determine maintenance (Cooper, Heron, & Heward, 2007) students read the additional four passages after the removal of the RRFC intervention. Reading scores on the

Figure 2

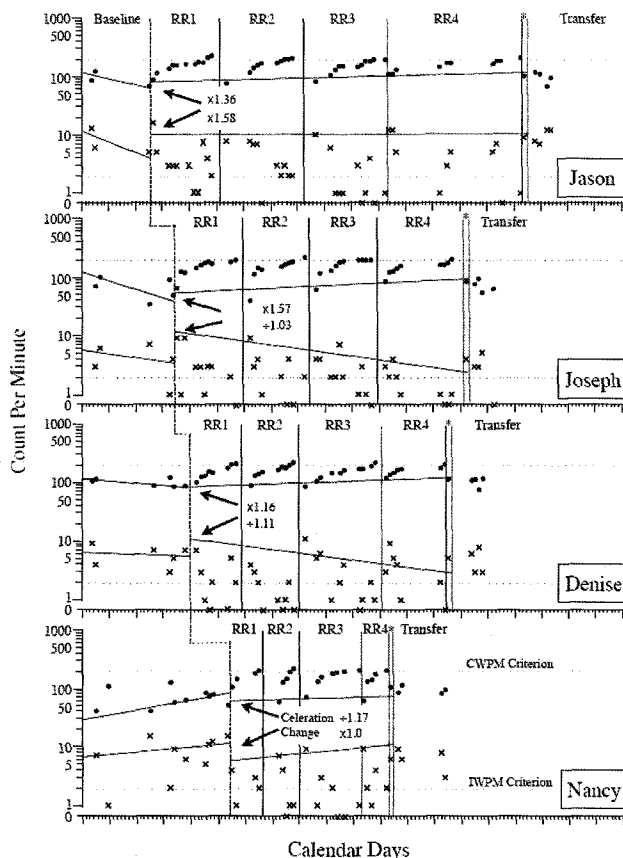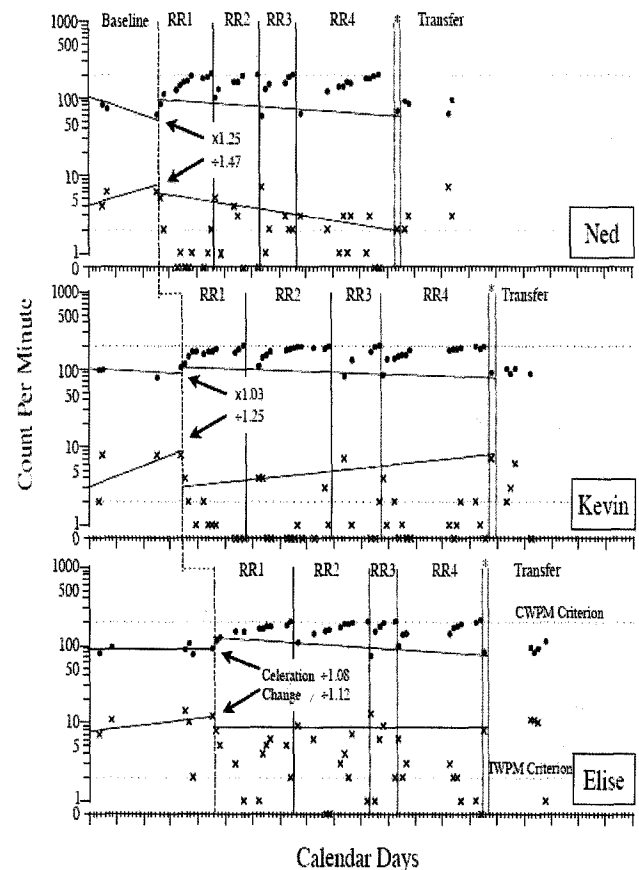**Reading scores for students in Group A.**

Figure 3

Reading scores for students in Group

Calendar Days

four additional readings also demonstrated reading transfer which refers to reading scores on unread passages following repeated reading other passages (Faulkner & Levy, 1994).

Group A students (Figure 2) read more CWPM (+8, range 4-20) and made less IWPM (-1, range -1-+2) on average during maintenance/transfer readings compared to baseline readings. Nancy reading an average of 94 (range 82-114) CWPM with 7 (range 3-9) showed the largest average increase (20 CWPM) from intervention to maintenance/transfer and improved from 90% to 93% average reading accuracy. Denise and Joseph improved their average reading accuracy (94% to 96% and 95% to 96%), CWPM (101 to 105 and 70 to 74), and IWPM (6 to 5 and 4 to 3) from baseline to maintenance/transfer readings. Joseph, while reading more CWPM (93 to 99) during maintenance/transfer readings, did make more IWPM (8 to 10) decreasing his average reading accuracy score from 91% to 90%.

Group B students (Figure 3) also improved from baseline to maintenance/transfer readings by reading an average of 8 (range 1-13) more CWPM and 2 (range 1-4) fewer IWPM which increased average reading accuracy from 92% to 95%. Elise made the greatest average gain of CWPM (+13) reading an average of 103 (range 92-115) CWPM during maintenance/transfer readings compared an average baseline CWPM score of 90 (range 78-106). Additionally, Elise decreased IWPM from 10 (range 5-14) to 9 (range 1-13) improving her reading accuracy from 90% to 92%. Ned improved average read-

ing accuracy from 94% to 95% by increasing average CWPM from 72 (range 61-81) to 83 (range 63-95) and decreasing IWPM from 5 (range 4-6) to 4 (range 2-7). Kevin made the smallest gains to average CWPM from 96 (range 79-106) to 97 (range 90-104) but displayed the largest jump in average reading accuracy (93% to 97%) due to the largest drop in average IWPM (7 to 3).

Taken together, all students averaged the highest number of CWPM (93.5) and the lowest IWPM (5.5) during maintenance/transfer readings. Furthermore, students improved average reading accuracy from 92% during baseline readings to 94% during maintenance/transfer readings.

Retells

Table 3 lists the retell scores in CWPM for both Group A and B. All students had eight oral retell opportunities. Retell tests occurred after the initial reading of each of the four repeated reading passages (i.e., pre-test) and immediately after a student met criterion on a passage (i.e., post-test).

Group A students averaged 17 CWPM during pre-test retells and 58 CWPM during post-test retells, an average increase of 41 CWPM. Nancy displayed the only pattern, across all students, of increasing improvements across all four passages (21, 43, 55, and 82 CWPM). Jason showed the smallest average increase from pre- to post-test retells with an average of 20 CWPM (range 12-31). However Jason, initially only gaining 12 and 10 CWPM during the first and second

Table 3

Retell Scores (Correct Words per Minute)

Group A	Repeated Reading 1		Repeated Reading 2		Repeated Reading 3		Repeated Reading 4	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Jason	37	49	31	41	2	33	24	51
Joseph	16	66	12	60	12	125	45	79
Denise	0	48	22	11	9	82	16	42
Nancy	27	48	24	67	0	55	0	82
Average	20.0	52.8	22.3	44.8	5.8	73.8	21.3	63.5
Group B								
Ned	27	60	6	74	0	59	8	37
Kevin	44	61	40	75	23	93	17	43
Elise	27	60	39	46	31	67	38	49
Average	32.7	60.3	28.3	65.0	18.0	73.0	21.0	43.0
Overall Ave.	26.3	56.6	25.3	54.9	11.9	73.4	21.2	53.3

pre/post-test retell opportunities, improved by 31 and 27 CWPM during the third and fourth opportunities. Joseph increased by an approximate average of 61 CWPM (range 34-113) from pre- to post-tests, showing a high retell score of 125 CWPM during passage 3. Denise had three improvements from pre-post-tests retells (48, 73, and 26 CWPM) but also provided the only example of a decrease from pre- to post-test (-11 CWPM) across both groups.

Group B also averaged an increase from pre- to post-test retells. Averaging 25 CWPM during pre-tests and 60 during post-tests, Group B retold approximately 35 more CWPM during post-tests. Ned had the highest average increase (47 CWPM, range 29-68) and Elise the lowest (22 CWPM, range 7-36). No student in Group B had consistent increasingly higher scores on each successive retell opportunity. However, Kevin showed increasing retell improvement scores for the first 3 passages (17, 35, and 70 CWPM), before showing a smaller increase in the final passages (26 CWPM). Factoring both groups together, average scores from pre- to post-tests improved by 38.8 CWPM (range, 29.6- 61.5).

Three correlations show the relationship between reading fluency, total amount of reading trials, and oral retell measures. The first association correlates retell scores and number of times the student read a particular passage before providing the retell. For example, students had one opportunity to read a passage before providing a pre-test retell. At criterion readings, the number of readings varied. The correlation ($r=0.63$) between the number of readings and retell scores suggests a moderate relationship.

The second and third correlations compared retell scores with the CWPM and IWPM each student made prior to performing each retell. CWPM and IWPM varied during initial readings, however at minimum, students read 200 CWPM and 2 or less IWPM during criteria readings. The positive correlation between retell score and CWPM ($r=0.74$) showed a strong relationship and the negative correlation between retell score and IWPM ($r=-0.59$) established a moderate relationship. While all comparisons had moderate to strong relationships, reading CWPM explained 55% (0.74^2) of retell variation while number of readings and IWPM explained only 40% (0.63^2) and 35% (-0.59^2) of retell variation, respectively.

Social Validity

The experimenter used four measures to investigate the social validity of the repeated reading to a fluency criterion intervention: a 5-point Likert scale questionnaire, student interview responses, a teacher questionnaire, and any other anecdotal observations and unprompted feedback collected during the course of the study. Students agreed most strongly with the statements, *If asked, I would read more passages* and *I am happy to know I can read fast.* Students disagreed most with the statements *I did not like to read fast* and *I did not like*

reading with Doug [the experimenter]. The statement *If my teacher had me read like Doug* [the experimenter] *did, I would like that* drew the most neutral responses.

All students agreed to answer the three exit interview questions after the final session. Students reported enjoying their participating in the study and shared their reasons. Some of the students explained they had fun reading fluently and reading new things. Other students liked learning new words and how not to skip over difficult words. In addition to reading fast, one student said he enjoyed leaving class and another liked to earn participation prizes. All but one student said that participating helped them with their science text.

The learning support teacher articulated that all participating students benefited from the intervention. She noticed the student's excitement for their turn to read, reaching and announcing daily high scores, and earning participation prizes. During class, she said she noticed *a positive change in student attitudes towards reading* and recognized that students started *reading more automatically displaying an upward trend in reading fluency.* She specifically noted that a parent had contacted her voicing approval for her child's oral reading improvement. The teacher indicated, if possible, to *definitely* try the repeated reading procedure in her classroom. The teacher received a demonstration and training of the study's procedures at the conclusion of the study.

Discussion

Students with disabilities often display early and consistent reading problems eventually leading to negative outcomes with textbook reading consisting mainly of expository text (Ciborowski, 1995). The current study demonstrated that students with disabilities can improve oral reading fluency with science text (i.e., expository text) when practicing to a high fluency criterion. As textbook-based instruction still remains pervasive within science education (Cawley , et al., 2003), having effective fluency-building procedures becomes paramount considering the important role of content reading fluency (Bhattacharya, 2006).

Science textbooks traditionally have reading levels well beyond their intended use (Bergerud , et al., 1988; Mastropieri & Scruggs, 1994) and the textbook used during the present research study, *From Bacteria to Plants* (Padilla , et al., 2007), shared similar characteristics. Although intended for 7th graders, selected passages had readability scores from 6th to 11th grades and *difficult* reading ease scores. Regardless, students showed consistent oral reading fluency improvements both within and between passages.

Question 1: What effect will reaching a fluency criterion on one passage have on initial, unpracticed readings of successive passages?

Correct words per minute. The present study used celerations, rather than frequency improvements (e.g., Samuels, 1979), to compare improving CWPM scores. Samuels initially suggested that once students reach criterion on one passage, students will score higher on successive passages. Student reading scores from the present study support Samuels' proposition. Frequency score improvements show only performance change, however, the use of celeration provides a clear picture of learning (Pennypacker , et al., 2003).

All students from Group A demonstrated accelerating CWPM celerations following intervention ranging from x1.03 to x1.10. Students from Group B did not demonstrate accelerations to initial reading scores during intervention. Unlike Samuels (1979), the current study had baseline initial reading scores allowing additional comparisons in the form of celeration changes.

Improving celeration changes from baseline to intervention may provide clearer analyses of intervention effects. Jason, Joseph, and Denise, while showing slight accelerations during intervention, had large CWPM celeration changes, x1.36, x1.57, and x1.16. In each case, the students' CWPM celerations turned from deceleration into acceleration. The celeration change multipliers mean the intervention had significant effects of positively changing the course of learning. Group B, as mentioned previously, had no students display accelerations to CWPM following baseline. Ned and Kevin, however, showed improving celeration changes, x1.25 and x1.03, respectively.

Samuels (1979) and others (Faulkner & Levy, 1994; Rashotte & Torgeson, 1985) refer to increasing initial reading scores as *reading transfer.* Five of seven students displayed reading transfer both during intervention and in comparison to baseline reading celerations. In fact, students displayed reading transfer with passages that contained word overlap averaging approximately 28%. In previous studies, students showed reading transfer with 30% (Kostewicz & Kubina, 2010), 50% (Rashotte & Torgeson, 1985) and 72% (Faulkner & Levy, 1994) overlapping words and, in the case of Faulkner and Levy, content overlap. Similar to the 28% word overlap found in the current study, Kostewicz and Kubina reported student reading transfer as a result of two fluency-building procedures, interval sprinting and RRFC, both with the same fluency criterion used during the current study.

Incorrect words per minute. Reading errors play a role in reading transfer and affect comprehension (Daane, Campbell, Grigg, Goodman, & Oranje, 2005). Samuels (1979) suggested errors decrease as students reach criteria on successive passages. Dahl (1974) also advised against recording errors because errors decrease during reading practice. As a result of such recommendations relatively few studies (e.g., Anderson & Alber, 2003; Carroll , et al., 1991; Kostewicz & Kubina, 2010; Polk & Miller, 1994) graphically display students' reading errors. Yet in the present study IWPM celerations did not

decelerate for every student. Jason's initial reading errors, for example, accelerated to x1.00 in intervention from ÷1.58 in baseline.

By not graphing errors, researchers may have difficultly evaluating student progress or may miss instances where reading errors do not decrease with intervention requiring procedural adjustments (e.g., Kostewicz & Kubina, 2010). In within passage cases, students could not move onto the next passage until meeting aforementioned error criterion of two or fewer errors. Students not required to meet a specific error criterion may progress to another passage while still making high rates of errors (e.g., McDowell , et al., 1998) potentially affecting future error rates and comprehension (Daane , et al., 2005). Even if students meet the criterion for CWPM an accompanying high degree of IWPM means the students have well practiced errors.

Question 2: Will reaching a fluency criterion on one passage impact the number of sessions necessary to reach fluency on successive passages?

Samuels (1979) proposed that students not only increase reading scores on successive passages, but also decrease amount of sessions necessary to reach criterion. Research has demonstrated students requiring fewer sessions to criterion after reaching fluency criteria on previous passages (Dowhower, 1987; McDowell, et al., 1998; Samuels, 1979). Other research (e.g., Polk & Miller, 1994; Spence, 2002; Wienstein & Cooke, 1992) has shown students requiring varying numbers of sessions to reach criterion on successive passages. Still other research (Staubitz , et al., 2006; Yurick , et al., 2005) substantiates students meeting criteria sooner and other students requiring additional sessions to meet criterion. Taking Samuels proposition of fewer sessions to criteria after reaching criterion as correct, changing passage readability may explain why, during the current study, students displayed varying number of trials to criterion.

Two studies (Spence, 2002; Yurick , et al., 2005) reported, as passage difficulty increases, students require more practice sessions to meet criterion. The basic model of repeated readings involves using passages of equal difficulty, rather than varying or increasing difficulty (Meyer & Felton, 1999). Elise and Ned decreased number of sessions to criterion over the first three passages as passage readability decreased. When readability increased to both students needed more sessions to meet criterion. Students from Group A demonstrated similar results although with more difficult passage readability. Overall, the eventual improvements suggest that over time RRFC may not only improve reading fluency, but also affect amount of time students reach criterion on passages with higher readability (e.g., Staubitz , et al., 2005).

Question 3: If students reach the fluency criterion on passages from one chapter would that affect performance on initial, un-

practiced readings from another chapter?

A student's ability to display improvement after removal of intervention demonstrates maintenance of intervention effects (Cooper, et al., 2007) and in the case of repeated reading interventions, reading transfer (Faulkner & Levy, 1987). Individually, all students outperformed average CWPM baseline reading scores during maintenance. Additionally, all students except Jason, increased average reading accuracy and decreased average IWPM during maintenance. Considering Lovitt, Horton, and Bergerund (1987) suggest students read 135 CWPM to effectively respond to science content, students maintaining and making further gains after four intervention passages suggests that continued use of the RRFC intervention may allow students to improve to a degree that they can functionally and fluently read science content.

Question 4: What effect will reaching fluency on a passage have on students' ability to retell what they read in that passage?

Gleason, Krauss and Tindal (n. d.) evaluated oral retell measures across three measures (i.e., holistic scoring, number of ideas, and number of words). Results indicated strong correlations between holistic scores, number of ideas and retells with the highest number of words suggesting a relationship between quality and quantity. Therefore, the importance of students in the current study improving, on average, 40 CWPM on oral retell tests after reaching fluency criteria demonstrates another benefit of RRFC. For example, Joseph showed some of the largest gains from pre- to post-tests increasing by 113 CWPM during the third passage and by over 40 on the other three passages. Nancy, over the final two passages, improved from 0 to 55 and 82 CWPM. The student making the lowest gains, Elise, still displayed an average improvement of 22 CWPM. While current research (e.g., Staubitz , et al., 2005; Therrien, et al., 2006; Yurick et al, 2006) shows various comprehension outcomes as a result of RRFC interventions, oral retells may provide a stronger estimate of reading comprehension as a result of fluency interventions (Roberts et al., 2005).

Roberts et al., (2005) offer four reasons for supporting the use of oral retells with reading fluency interventions. First, students can provide an oral retell without completing an entire passage. During study pre-tests and baseline readings, students read less than 50% of passage, yet provided oral retells. Second, students can complete oral retells in a time efficient manner. RRFC intervention sessions with retells accounted for no more than a minute increase to session length. Third, students can generate many comprehension-like behaviors in a short amount of time. As compared to adding five words to a passage via cloze procedures (e.g., Staubitz, et al., 2005), students commonly responded during oral retells with approximately 30 words pertaining to each passage. Fourth, oral retells quickly identify students whose reading

fluency and comprehension do not relate. After reaching fluency criteria, students commonly responded with higher oral retell rates in post-test situations demonstrating the relationship between reading comprehension and reading fluency.

Another measure, reading accuracy or the combination of corrects and incorrects, contributes to reading comprehension. Students met aims of, at minimum, 99% before moving onto new passages. Daane , et al., (2005) reported that students did not score significantly different from a basic range when reading with 90% and 97% accuracy. Haughton (1982) proposed practicing to high levels for students to perform at basic levels. Considering the previous relationships corrects and errors have on reading comprehension, students should read to fluency criteria that include both to the highest accuracy measure possible.

Limitations

Using the fourth reading as the criterion reading, students started to read passages differently as the study progressed. Students received prompting to read as fast as they could throughout the study. However, both reading scores and student comments suggest that some students started to *save* their fastest reading for the fourth reading in order to meet criterion. Therefore, the current RRFC model while effective in building science reading fluency may not have promoted the most efficient use of reading time.

Another limitation regarding one student, Nancy, involved the introduction of intervention. Nancy remained in baseline until her CWPM reading scores stabilized, x1.00, or decelerated. After seven readings, Nancy's reading scores had not stabilized and she remained in baseline for an additional three readings. Because Nancy's CWPM showed a deceleration over the final five readings (i.e., the additional three readings combined with the two previous readings), Nancy started intervention. However, Nancy maintained an overall acceleration, x1.28, during baseline concurrent with an acceleration to IWPM. These two celerations mean Nancy, while increasing reading speed also made more errors suggesting an appropriate introduction of the intervention. Regardless, the addition of more baseline readings, rather than only three, may have allowed Nancy's overall CWPM celeration to stabilize.

Implications for Practitioners

The method of repeated readings to a fluency criterion holds promise for improving science literacy. Teachers can have lower achieving students take turns daily reading to an aide, paraprofessional, or another student able to provide effective error correction, feedback, and data collection/ presentation. Peers, however, would require procedural training and close adult supervision during application considering the dif-

ficult science vocabulary (Staubitz et al., 2005). Teachers can also have students read a passage three, rather than four, times daily (Therrien, 2004) allowing students to attain fluency.

Decisions regarding specific science readings would depend on the type of instruction. Teachers using science textbooks could identify pertinent passages across topics or target a series of passages used over the course of the school year. Teachers who provide supportive text-book interventions such as study guides (e.g., Bergerud et al., 1988), graphic organizers (e.g., Horton et al., 1990) or concept maps (e.g., Guastello et al., 2000) could also match passages targeted for RRFC practice and accompanying oral retell fluency measures with the upcoming modification.

Compared to text-book based instruction, teachers using inquiry- or activity-based instruction tend to employ fewer science texts with their lessons (e.g., Caseau, & Norman, 1997; Lynch et al., 2007). Teachers responsible for covering specific topics for discussion and inquiry would identify various 200+ word passages with content overlapping the current topics for investigation. Students receiving RRFC practice could quickly generate reading fluency with scientific terms that may assist them during discussion, questioning, and experimentation. Teachers who wish to incorporate literature to enhance science literacy (e.g., Freeman & Taylor, 2006; McKee & Ogle, 2005) can also use RRFC practice procedures, as RRFC methods have previously shown the ability to improve oral reading fluency with narrative text (Chard et al., 2002; Therrien, 2004).

The methods of RRFC may also help bridge science and special education. For students spending part of the day in general education science and learning support settings, a cooperative approach may help students with disabilities improve their science reading fluency. Science teachers can identify a series of important science passages that students would practice using RRFC procedures in the learning support classroom. Additionally, special education teachers fully responsible for a student's science instruction can consult with science teachers during passage identification. Joint approaches to science education could better support students with disabilities.

Future Directions for Researchers

As the first study of repeated readings to a fluency criterion with science text many interesting research questions arise. Namely, would the systematic replication of RRFC procedures with different science texts, different aged students both with and without special needs produce the same of different results? Researchers could reduce the number of readings from four to three and/or allow students to meet criteria on any reading rather than the final reading only. Additional modifications to the RRFC procedures may include various

error correction procedures, such as phrase drill (e.g., Martens , et al., 2007), as a possible way to further decelerate errors. Examination of oral retells may benefit from both quantity and quality measures (e.g., Gleason , et al., n.d.). Future research might also investigate the use of a writing exercise after reaching criteria. In addition, researchers can examine if the RRFC results replicate in peer-mediated formats (e.g., Staubitz, et al., 2005; Yurick, et al., 2006) or if the difficulty of the material requires an adult mediator. Based on these possible modifications to the procedures, research can further solidify both the effectiveness and the efficiency of the RRFC procedures.

Conclusions

For the past 20 years, education reform has made the goal of promoting science literacy for all students a priority. However, students with disabilities continue to perform poorly in science due in part to reading difficulties. In response, science and special education researchers have suggested various curricula and modifications to promote and support students with disabilities. One model, repeated readings to a fluency criterion, has improved students with disabilities oral reading fluency. Students not only showed oral reading fluency improvements within passages, but also improved their reading performance on novel science passages both within and between chapters. As a result of building passages to a criterion of 200 words per minute with 2 or less errors, students also demonstrated increased oral retells. Based on the results of the present experiment, the model of repeated readings to a fluency criterion deserves further attention for students with disabilities struggling to read science text fluently.

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