A Comparison of the Incremental Rehearsal Method, the Pocket Word Method, and Repeated Reading Instructional-Level Text on the Word Retention, Words Read Per Minute, and Comprehension of First-Grade Students

Lara Lynne MacQuarrie

Andrews University

This research is a product of the graduate program in Educational Leadership PhD at Andrews University. Find out more about the program.

Follow this and additional works at: http://digitalcommons.andrews.edu/dissertations

Part of the Educational Methods Commons

Recommended Citation

ABSTRACT

A COMPARISON OF THE INCREMENTAL REHEARSAL METHOD, THE POCKET WORD METHOD, AND REPEATED READING IN INSTRUCTIONAL-LEVEL TEXT ON THE WORD RETENTION, WORDS READ PER MINUTE, AND COMPREHENSION OF FIRST-GRADE STUDENTS

by

Lara Lynne MacQuarrie

Chair: James A. Tucker
ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: A COMPARISON OF THE INCREMENTAL REHEARSAL METHOD, THE POCKET WORD METHOD, AND REPEATED READING IN INSTRUCTIONAL-LEVEL TEXT ON THE WORD RETENTION, WORDS READ PER MINUTE, AND COMPREHENSION OF FIRST-GRADE STUDENTS

Name of researcher: Lara Lynne MacQuarrie

Name and degree of faculty chair: James A. Tucker, Ph.D.

Date completed: April 2012

As partial fulfillment of a doctoral degree in Educational Leadership, a retrospective, multi-element study was performed. The study compared the Incremental Rehearsal method (IR) and the Pocket Word method (PW) to each other and to Repeated Reading (within Instructional Level [RR-IL]) by individually teaching words from the Dolch Word List to first-grade students. The effects of IR, PW, and RR-IL on the word retention, reading accuracy, words read per minute, passage retell, and aided comprehension of seven first-grade students were compared. The Peabody Picture Vocabulary Test (4th edition) and the Dolch Word List were administered prior to intervention. The three conditions were administered at a rate of a single intervention
every 24 hours (Monday, Tuesday, Wednesday, and Thursday) in order to counterbalance the intervention effects. Word retention, reading accuracy, and words read per minute were assessed at 24 hours and 7 days after each condition. Reliability of the administration was assessed by a school psychologist.

The findings demonstrate an increase in the total number of words retained from pre-measure to post-measure on the Dolch Word List for each individual student and across all students. A visual analysis of individual cumulative data showed an increase for each student, an increase for all students, and confirmed the differentiation of conditions between the IR and PW method from the RR-IL method. As such, positive effects were found for the IR and PW methods for word retention at 1 and 7 days for each student and across students. The IR method demonstrated differentiation from PW and RR-IL for words read correctly in text. Limitations, observations, and recommendations for further study are discussed.
Andrews University
School of Education

A COMPARISON OF THE INCREMENTAL REHEARSAL METHOD, THE POCKET WORD METHOD, AND REPEATED READING IN INSTRUCTIONAL-LEVEL TEXT ON THE WORD RETENTION, WORDS READ PER MINUTE, AND COMPREHENSION OF FIRST-GRADE STUDENTS

A Dissertation
Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

by
Lara Lynne MacQuarrie

April 2012
A COMPARISON OF THE INCREMENTAL REHEARSAL METHOD, THE POCKET WORD METHOD, AND REPEATED READING IN INSTRUCTIONAL-LEVEL TEXT ON THE WORD RETENTION, WORDS READ PER MINUTE, AND COMPREHENSION OF FIRST-GRADE STUDENTS

A dissertation presented in partial fulfillment of the requirements for the degree Doctor of Philosophy

by

Lara Lynne MacQuarrie

APPROVAL BY THE COMMITTEE:

Chair: James A. Tucker

Dean, School of Education

James R. Jeffery

Member: Matthew K. Burns

Member: Gary Gifford

External: Date approved
Dedicated to my brother,

Douglas Vinall MacQuarrie
TABLE OF CONTENTS

LIST OF TABLES ................................................................. vii
LIST OF FIGURES ............................................................. vii
ACKNOWLEDGMENTS .......................................................... x

Chapter
I. INTRODUCTION. ........................................................... 1

   Background Information .................................................. 1
   Statement of the Problem .................................................. 5
   Significance of the Study .................................................. 6
   Research Questions .......................................................... 9
   Definition of Terms ........................................................ 11
      Acquisition Rate ......................................................... 11
      Comprehension .......................................................... 12
      Curriculum-based Assessment ....................................... 12
      Drill Sandwich .......................................................... 13
      Esperanto ............................................................... 14
      Fluency ................................................................. 14
      Information Processing Model ...................................... 14
      The Incremental Rehearsal Method ................................. 15
      The Instructional Level ............................................... 16
      Interference Effect ..................................................... 16
      Interspersal ............................................................. 17
      Multi-element Research Design .................................... 17
      Opportunity to Respond ............................................. 17
      The Pocket Word Method ............................................. 18
      Repeated Reading ...................................................... 19
      Repeated Reading at the Instructional Level ..................... 19
      Retell ................................................................. 19
      Retrospective ........................................................ 20
      Single-Case Design ................................................... 20
      Traditional Drill ...................................................... 21
      Words per Minute ...................................................... 21
      Word Recognition ..................................................... 22
      Working Memory ....................................................... 22
   Assumptions Inherent Within the Study ............................ 23
Limitations .................................................. 23
Delimitations .............................................. 24
Organization .............................................. 25

II. BACKGROUND AND REVIEW OF THE LITERATURE ............... 26
Retrospective Research .................................... 26
Single-Case Design Research .............................. 27
Multi-element Design ..................................... 29
Foundational Research ................................... 29
Interspersal Methods ..................................... 32
  Incremental Rehearsal Method ......................... 32
  The Pocket Word Method ............................... 37
  Repeated Reading at the Instructional Level .......... 38

III. METHODOLOGY ................................................. 39
Participants and Setting .................................. 39
Selection of the Participants .............................. 40
Screening ................................................... 40
Description of the Participants .......................... 41
Dependent Variable ...................................... 42
Experimental Intervention ............................... 43
The Incremental Rehearsal Method ....................... 45
The Pocket Word Method ................................ 46
Repeated Reading in Instructional Level Text ......... 46
Materials .................................................... 49
Inter-Observer Agreement ................................ 50
Experimenter Training ................................... 50
Experimental Design ..................................... 51
Benefits of the Study ..................................... 51

IV. RESULTS .......................................................... 53
Research Questions ....................................... 53
Research Question 1 ...................................... 54
  Word Retention .......................................... 54
  Word Retention by Condition: Descriptive Statistics 55
Research Question 2 ...................................... 63
  Generalization in Harcourt Text: All Students’ Known 63
    Words ..................................................... 63
  Generalization in Harcourt Text: Individual Student Known 63
    Words by Student ..................................... 64
Research Question 3 ...................................... 65
  Generalized Words-per-Minute: Grade-Expected Harcourt 65
    Text .................................................... 65
Research Question 4 .......................................................... 74
Retell by Condition ........................................................... 74
Retell by Condition: Individual Student Graphs ....................... 75
Research Question 5 .......................................................... 82
Aided Questions: Percentage Correct .................................... 82
Synthesis of Results .......................................................... 90

V. DISCUSSION ................................................................. 93

Summary and Comparison to Other Studies ............................... 93
Implications of the Study .................................................... 101
Theoretical Implications .................................................... 103
Suggestions for Further Research ......................................... 104
  Theory ........................................................................... 104
  Practice ......................................................................... 105
Recommendations ............................................................... 105
  Theory ........................................................................... 105
  Practice ......................................................................... 106
Concluding Statement .......................................................... 107

Appendix

A. CONDITION 1: INCREMENTAL REHEARSAL METHOD .......... 108

B. CONDITION 2: POCKET WORD METHOD ............................ 111

C. CONDITION 3: INSTRUCTIONAL LEVEL TEXT ..................... 113

REFERENCE LIST ............................................................. 115

VITA ................................................................................... 128
LIST OF TABLES

1. Acquisition Rate ................................................................. 11
2. Acquisition Rate and Peabody Picture Vocabulary (PPVT) Age-Based Standard Score (SS) for Each Student. ......................................................... 45
3. Word Retention by Condition .................................................. 55
4. Mean Percentage of Words Read Correctly in Generalized Harcourt Text by Condition .............................................................. 64
5. Generalization to Harcourt Text: Comparison of WPM by Condition .......................... 66
6. Mean and Median Number of Words Retold by Condition ............................. 74
7. Percentage of Aided Questions Correctly Answered by Condition by Student .... 82

LIST OF FIGURES

1. Dolch List Pre- and Post-Word Retention ........................................ 55
2. Cumulative Words Retained 24 Hours (Student 1) .............................. 56
3. Cumulative Words Retained 24 Hours (Student 2) .............................. 57
4. Cumulative Words Retained 24 Hours (Student 3) .............................. 57
5. Cumulative Words Retained 24 Hours (Student 4) .............................. 58
6. Cumulative Words Retained 24 Hours (Student 5) .............................. 58
7. Cumulative Words Retained 24 Hours (Student 6) .............................. 59
8. Cumulative Words Retained 24 Hours (Student 7) .............................. 59
9. Cumulative Words Retained 7 Days (Student 1) ......................... 60
10. Cumulative Words Retained 7 Days (Student 2) ....................... 60
11. Cumulative Words Retained 7 Days (Student 3) ....................... 61
12. Cumulative Words Retained 7 Days (Student 4) ....................... 61
13. Cumulative Words Retained 7 Days (Student 5) ....................... 62
14. Cumulative Words Retained 7 Days (Student 6) ....................... 62
15. Cumulative Words Retained 7 Days (Student 7) ....................... 63
16. Generalization in Harcourt Text by Condition (Student 1) ................. 67
17. Generalization in Harcourt Text by Condition (Student 2) ................. 68
18. Generalization in Harcourt Text by Condition (Student 3) ................. 69
19. Generalization in Harcourt Text by Condition (Student 4) ................. 70
20. Generalization in Harcourt Text by Condition (Student 5) ................. 71
21. Generalization in Harcourt Text by Condition (Student 6) ................. 72
22. Generalization in Harcourt Text by Condition (Student 7) ................. 73
23. Retell: “Tell Me What You Read” by Condition (Student 1) ................. 75
24. Retell: “Tell Me What You Read” by Condition (Student 2) ................. 76
25. Retell: “Tell Me What You Read” by Condition (Student 3) ................. 77
26. Retell: “Tell Me What You Read” by Condition (Student 4) ................. 78
27. Retell: “Tell Me What You Read” by Condition (Student 5) ................. 79
28. Retell: “Tell Me What You Read” by Condition (Student 6) ................. 80
29. Retell: “Tell Me What You Read” by Condition (Student 7) ................. 81
30. Aided Questions Percentage Correct by Condition (Student 1) ................. 84
31. Aided Questions Percentage Correct by Condition (Student 2) ................. 85
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>32. Aided Questions Percentage Correct by Condition (Student 3)</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>33. Aided Questions Percentage Correct by Condition (Student 4)</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>34. Aided Questions Percentage Correct by Condition (Student 5)</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>35. Aided Questions Percentage Correct by Condition (Student 6)</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>36. Aided Questions Percentage Correct by Condition (Student 7)</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>
ACKNOWLEDGMENTS

Gratitude is not only the greatest of virtues, but the parent of all others
—Cicero, 160 BC-43 BC

We cannot live only for ourselves. A thousand fibers connect us with our fellow men—Herman Melville

I wish to express my eternal gratitude for the love and support of my family; the roads they travelled from Italy, England, Scotland, and Germany; the sacrifices they made; and their unwavering hope for the future. I wish to express my appreciation for my great-grandmother, Elvira Balboni, for teaching me that she who laughs, loves, and makes tortellini is rich. I wish to thank my grandfather, James Alexander Vinall, for showing me that success is a life of experience and the love of life, work, and family; my grandmother, Myra Schwanbeck MacQuarrie, for sharing her love of reading; and my grandmother, Anne Vinall, for showing me how to dance into my 90s and how to put what is good for many above what is good for one.

I wish to express my deepest appreciation and admiration for my mother, Dr. Patricia MacQuarrie, who received her doctoral degree while working full-time, raising her children, and caring for her parents. I’d like to thank my father, Don MacQuarrie, who has shown me strength in belief, mission, and commitment. I would like to thank my brother, Douglas Vinall MacQuarrie, for his service to our country, leadership in his career and life, and for the opportunity to share in the sheer joy of your family.
I would like to express my gratitude for my sons, Kirk and Kameron; there is no greater joy than to see the happiness and light in your eyes, to watch you learn and master each new challenge, to appreciate the depth of your curiosity and generosity of your souls. Thank you for your patience and your sense of humor. Thank you to my god-daughter and niece; you bring light, hope, and love into our hearts just by being you. The completion of this project would not have been possible without the love and support of each of you.

I would like to thank Dr. Kathleen Golinski, Karen Rockhold, and Kathy Barker, Oakland Schools; Ms. Nancy Coratti and Mrs. Julie Conn, Huron Valley Schools; Mrs. Phillips and Mrs. Evans, Kurtz Elementary School; and the staff for their collaboration, support, and assistance. I would like to extend my deep appreciation for each of the seven students who participated in this study and to their families. To Gary Longfellow and Jennifer Vandertuk-Perkins, I have enjoyed this journey with each of you and look forward to celebrating your success.

My sincere gratitude and appreciation are extended to each member of my dissertation committee. I am grateful for the time, wisdom, and efforts of Dr. James A. Tucker, Dr. Matthew K. Burns, and Dr. Gary Gifford. Thank you for supporting this project, challenging my thinking, and providing me with one of the deepest learning opportunities of my life. I am honored to learn from each of you.

Finally, thank you to you, the reader, to the teachers who touch our lives each and every day, and to the researchers who seek to fill in the pieces of the learning puzzle, may you find something in this document that will help a child. As a wise man once wrote,
“Unless someone like you cares a whole awful lot, nothing is going to get better. It’s not”
(Dr. Seuss).
CHAPTER I

INTRODUCTION

The purpose of this chapter is to provide background information to the reader, review relevant literature to the study at hand, as well as to describe the statement of the problem, discuss the significance of the study, research questions, definition of terms, assumptions inherent within the study, limitations, delimitations, and organization.

Background Information

The field of education is shifting toward a focus on success for all students within the general education setting and within the general education curriculum (Individuals with Disabilities Education Improvement Act [IDEIA], 2004). The President’s Commission on Excellence in Special Education (PCESE, 2002) and No Child Left Behind Act (NCLBA, 2001) have increased the pressure on all educators, including school psychologists, to help each child to succeed. The Individuals with Disabilities Education Improvement Act (IDEIA, 2004) mandates access to, and progress in, the general education curriculum for students with disabilities as well as the use of scientifically research-based or peer-reviewed strategies, to determine the student’s response to instruction (IDEIA, 2004). Our national focus has shifted to improving educational outcomes for all students (IDEIA, 2004).
Recent data suggest that approximately 33% of fourth-grade students cannot read at a basic level, and approximately 75% of dropouts reported academic difficulty in learning to read (National Center for Education Statistics, 2009). Some argue that as many as 20-30% of all students are “falling through the cracks” in the area of reading (Sternberg & Grigorenko, 1998). These students become curriculum casualties (Gickling & Havertape, 1981; Hargis, 1982) who experience a mismatch between their skills and the demand of the curriculum, yet are not eligible for special-education services.

In addition, approximately 2.8 million children in the U.S. are eligible for services under the “specific learning disabilities” category and, of the 2.8 million children with learning disabilities, between 80-90% have a primary difficulty in learning to read (National Center for Education Statistics, 2009; Pasternack, 2002). Researchers estimate that as many as 85-90% of the students receiving special education services have mild (learning) disabilities (Algozzine & Korinek, 1985; Dunn, 1968; Murphy, 2003; Reschly, 1987). Yet, with all of the service that is being provided, only 16% of fourth-grade and approximately 7% of eighth-grade students with disabilities are at or above proficiency in reading on the National Assessment of Educational Progress (National Center for Education Statistics, 2009).

While referrals to school psychologists have historically been noted to be mainly for academic problems (Ownby, Wallbrown, d’Atri, & Armstrong, 1985; Shapiro, 1992, 1996), the role of the school psychologist related to increasing achievement in reading within our current system continues to be debated. While some school psychologists continue to provide single-shot, norm-referenced evaluations to determine eligibility, some school psychologists view assessment differently. The movement toward school
psychologists providing ongoing assessment to monitor student progress over time, as well as effective instructional interventions when student progress is not being made, has been suggested to increase the relevance of the school psychologist to student outcomes (Burns, 2007; Gickling & Thompson, 1985; Kovaleski, Tucker, & Duffy, 1995; Reschly & Ysseldyke, 1995).

The call for a paradigm shift to school psychologists (Reschly & Ysseldyke, 1995) to move away from a “correlational discipline” to an “experimental discipline,” including school psychologists’ use of single-subject research designs (Barlow & Hersen, 1984) to improve individual student outcomes has been clearly sounded. Kratochwill and Shernoff (2004) state: “The scientist-practitioner model entails at least three dimensions: (a) the involvement of practitioners in research agendas; (b) practitioner use of research-based procedures and techniques in practice; and (c) practitioner evaluation of interventions in practice through research and program evaluation (e.g., use of single-participant or time-series designs to evaluate treatments)” (p. 46). While there is support in the literature as well as the IDEIA 2004 mandate for peer-reviewed research, single-subject designs are not yet consistently implemented as a research-based practice by the field of school psychology to determine the most effective intervention for individual students (Horner et al., 2005; Odom & Strain, 2002; Tawney & Gast, 1984; Wolery & Dunlap, 2001).

The call for reform also included the development of the practice of curriculum-based assessment. Curriculum-based assessment provides a bridge between student difficulty, student assessment, and improved achievement outcomes for students (Coulter, 1988; Gickling & Havertape, 1981; Gickling, Shane, & Croskery, 1989; Gickling &
Thompson, 1985; Rosenfield & Kuralt, 1990; Tucker, 1985) and has been effective within the use of single-subject research designs (Burns, 2004b; Burns, Dean, & Klar, 2004; Jimerson, Burns, & VanDerHeyden, 2007; Riley-Tillman & Burns, 2009). However, despite curriculum-based assessment’s bridge between the student, the assessment, and the instructional outcomes for students, most psychologists spend approximately 50% of their time testing for special-education eligibility (Canter, 2006; Wilson & Reschly, 1996). While the acceptance of curriculum-based assessment has increased within the field (Shapiro, Angelo, & Eckert, 2004), another (Reschly & Ysseldyke, 2002) study of the role of the school psychologist suggests that psychologists spend the least amount of time involved in conducting research as compared to assessment, consultation, and direct intervention and often do not use an approach to assess the individual student’s responses to research-based instructional practices using single-subject research design (Burns & Boice, 2009). Without increased psychologist use of curriculum-based assessment and application of single-subject design research, students may have to wait, falling further behind, prior to a determination of the most effective instructional methodology for the individual student.

If interventions are studied (i.e., single-subject research) prior to the implementation of an intervention, then the most-effective intervention for the individual student can be determined. If the most-effective intervention for the individual student can be determined, then implementation of the most-effective intervention versus the least-effective or moderately effective intervention can occur. Implementation of the most-effective intervention can lead to an avoidance of circumstances as described in a longitudinal study (Juel, 1988) of 54 first-grade students who were identified as being the
poorest readers in the first-grade and continued to be the poorest readers in fourth grade. Early identification of problems can increase student success (Torgesen, 2002), educational decisions should involve the use of data (Ysseldyke et al., 2006), and interventions should be research-based and peer reviewed (IDEIA, 2004).

This study responded to the call for reform by putting research into practice within the role of school psychologists (Reschly & Ysseldyke, 1995). This study explored scientifically research-based reading interventions (IR, PW, RR-IL), using single-subject research design (Barlow & Hersen, 1984) in order to determine a match between the student and the most effective intervention (Gravois & Gickling, 2002a; 2002b) so as to increase students’ experience of success in reading (Hargis, 1987).

**Statement of the Problem**

We know that there are students sitting in first-grade classrooms right now receiving instruction which is not effective in teaching them new words, helping them retain new words, or begin to develop reading fluency (Hasbrouck & Tindal, 2006; Juel, 1988). Single-subject research designs can determine which instructional strategy is most effective for an individual student and can lead to increased instructional efficiency for the individual student (Kazdin, 1982; Kratochwill, 1992). As such, this study compares the effectiveness of the Incremental Rehearsal method, the Pocket Word method, and repeated reading in instructional level text (93-97% known words) as measured by word retention (after 24 hours and 7 days), words read per minute, and narrative retell of 7 first-grade students by using a multi-element research design.

This study extends the research base on the impact of the Incremental Rehearsal method on generalization, that is, reading in text. While Gickling and Armstrong (1978)
studied the effect of instructional level, on task completion, task comprehension, and on-task behavior, relatively few studies (i.e., Burns [2007]), have studied the impact of maintaining an instructional level on oral reading fluency. As such, further research is needed on drill ratios, for example, 90% known to 10% unknown, as well as on generalization, such as increased fluency in reading (Burns, 2004a, 2007; Burns, Dean, & Foley, 2004).

**Significance of the Study**

This study is significant in that some additional data will be added to the literature to either support or begin to question the claim of T.A. Gravois and E.E. Gickling (personal communication, May 9, 2006) that the Pocket Word method is the most effective method for pre-teaching unknown words. This study is also significant in that it may provide some evidence to support, or refute, developmental acquisition rates for first-grade students as referenced by Gravois and Gickling (2002a, 2002b) and the conclusions of Skinner (2008) and Nist and Joseph (2008) around efficiency (length of time for administration).

The Incremental Rehearsal method (IR) (Tucker, 1989a) has been established in the literature as an effective method for teaching unknown words as measured by word retention rates for general education students as well as students eligible for special education services in the area of reading (Burns, 2002, 2004a, 2004b, 2007; Burns & Dean, 2005a, 2005b; Burns, Dean, & Foley, 2004; MacQuarrie, Tucker, Burns, & Hartman, 2002; Nist & Joseph, 2008; Shapiro, 1992; Skinner, 2008) as well as letter identification for preschool students (Bunn, Burns, Hoffman, & Newman, 2005). The use of the Incremental Rehearsal method to pre-teach unknown words has been shown to
generalize to an increase in oral reading fluency rates (Burns, 2004a, 2004b; 2007, Burns, Dean, & Foley, 2004; Shapiro, 1992) an increase in reading comprehension (Burns, 2004a; Burns, Dean, & Foley, 2004; Shapiro, 1992) and an increase in multiplication fact fluency (Burns, 2002, 2005).

Szadokierski and Burns (2008) provided a large number of opportunities to respond and a high percentage of known to unknown items (90%) known to 27 fourth-grade students and found that the opportunity to respond led to the largest effect size on retention of the pronunciation and meaning of Esperanto words and the ratio of known material had less effect (Szadokierski & Burns, 2008). While the Incremental Rehearsal method has been shown to maintain the highest rates of retention when compared to other ratios, other methods of pre-teaching, such as Pocket Words, have been suggested as easier and more efficient for teachers to use in the classroom (Gravois & Gickling, 2002b). Criticism of the Incremental Rehearsal method has included the efficiency (amount of time) the method takes, that is, 20-27 minutes on average (Burns, 2001; Burns & Boice, 2009; Skinner, 2008; Szadokierski & Burns, 2008). While alternate strategies have been suggested due to the amount of administration time and teacher ease (T.A. Todd Gravois & E.E. Gickling, personal communication, May 9, 2006; Nist & Joseph, 2008; Skinner, 2008), research has not yet been conducted to compare the Pocket Word method suggested by Gravois and Gickling (2002b) to the Incremental Rehearsal method on word retention, words read per minute, and comprehension. In addition, only a handful of published research has been identified in connection with the use of the Incremental Rehearsal methods with first-grade students (Burns, Dean, & Foley, 2004; Nist & Joseph, 2008).
Much of the research that has been conducted using generalization measures with the Incremental Rehearsal method has involved only a few participants. In addition, researchers have questioned whether the improved results on generalization (in text) measures were due to the increased known word base or instructional level reading (Burns, 2007), which suggests a need for further replication. In addition, more data are needed on the effect of using an acquisition rate (Burns, 2004c; Burns & Dean, 2005b), especially with first-grade students. Burns (2001) studied first-grade, third-grade, and fifth-grade students to determine sight-word acquisition and retention rates using the Incremental Rehearsal method and advised that “caution should be used when attempting this technique with students in the first grade because research has consistently demonstrated that younger students acquire and retain less information” (p. 154). Gravois and Gickling (2002a, 2002b) referenced research which suggested one new item for 3-year-old students, two new items for 5-year-olds, three new items for 7-year-olds. About three new items at one time for students at the age of 7, or first-grade equivalent, would be the average expected acquisition rate. As such, research by Nist and Joseph (2008) may have exceeded the developmental acquisition rate of three new items suggested for first-grade students referenced by Gravois and Gickling (2002a, 2002b) when six new items were presented at one time (i.e., six acquisition items may be more developmentally appropriate for 13-year-olds as opposed to 6-7-year-olds).

Researchers have requested additional single-subject studies using acquisition rates and to confirm, or dispute, the developmental rates referenced by Gravois and Gickling (2002a, 2002b). As such, this study similarly replicated, conceptualized, and applied acquisition rates for these seven students.
Burns, Dean, and Foley (2004) explored the use of IR in pre-teaching unknown words and the effect on fluency and comprehension; however, the measurement of comprehension was conducted at the aided, or “Wh,” level alone. Comprehension can be assessed as part of a continuum of responding (Gravois & Gickling, 2002b). The continuum involves asking unaided questions or “Tell me what you read,” aided questions or “Who, what, when, where, how questions,” forced-choice questions “Is it a __ or a __?” and visual referent questions. As such, differences over time across the continuum of questions could be noted.

**Research Questions**

The primary research question is: What is the impact of repeated reading in instructional level (93-97% known) text, the Incremental Rehearsal method, and the Pocket Word method on the reading of first-grade students. More specifically:

1. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on word retention for each student?

2. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on generalization of learned words within reading curriculum?

3. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on words read per minute for each student?

4. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on retell of grade-expected text?
5. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on the percentage of correct responses to five aided questions “Who, What, When, Where, How?”

As such, the purpose of this research was to determine the effect of repeated reading at the instructional level, use of the Incremental Rehearsal method, and use of the Pocket-Word method on word retention, words read per minute within Harcourt grade-expect text, and narrative text retell of seven first-grade students.

One might hypothesize that the Incremental Rehearsal method (90% known, 10% unknown) will yield higher rates of retention for students than the instructional level passages due to the increased opportunities to respond (Burns, 2007; Daly, Hintze, & Hamler, 2000; Greenwood, Delquandri, & Hall, 1984; Logal & Klapp, 1991; MacQuarrie et al., 2002), increased repetition rates (Gates, 1930; Gickling & Havertape, 1981), and high level of success (Hargis, 1982). There are also some single-subject data to show that pre-teaching words with the Incremental Rehearsal method also leads to increased comprehension and fluency (Burns, 2002, Burns & Dean, 2002; Burns, Dean, & Foley, 2004). One might hypothesize that learning new words through repeated reading within instructional level text may lead to increased words read per minute as has been demonstrated in the literature (Burns, 2007; Gickling & Havertape, 1981). One might also hypothesize that the Pocket Word method with a drill ratio of 100% unknown, which falls below the minimal ratio recommended by Burns (2002) of 50% known, would yield a lower rate of retention. In addition, one might hypothesize that different interventions may work for different students. Finally, one may hypothesize that using the individual child’s acquisition rate may lead to higher rates of retention for the Incremental Rehearsal
method than previous studies that did not consider acquisition rate (MacQuarrie et al., 2002). In other words, continuous success, reduced error, and presenting new information within the child’s acquisition rate may lead to increased word retention due to the reduced interference effect of errors.

**Definition of Terms**

Definitions of terms as used in the research literature are included for each of the variables of study and related terminology.

**Acquisition Rate**

Acquisition rate refers to how much a student can learn prior to becoming frustrated. Leon (as cited in Wolf, 1993) references general guidelines for acquisition rate, as noted in Table 1.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acquisition Rate</strong></td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>13</td>
</tr>
</tbody>
</table>

*Note.* Capacity is the number of information bits that can be learned at one time.
Acquisition Rate (AR), as defined by Burns (2001), is when three errors are made during drill format in the process of learning a new word, instruction stops and items are again presented to the student, and a correct response is prompted. The acquisition rate also applies to the number of items that the child can then correctly identify after a specified period of time (Burns, 2001). Burns and Dean (2005b) assessed the acquisition rate (AR) of five students receiving special education services as students with learning disabilities and explored the impact of exceeding AR on off-task behavior. The researchers found less off-task behavior prior to exceeding their acquisition rate.

Comprehension

Comprehension is essentially the ability to understand what has been read. The National Reading Panel (2000) suggests that connections between mastery of basic skills composing the big ideas of reading (phonemic awareness, phonics, and later, word study, word recognition, and word meaning) may impact a child’s subsequent fluency and comprehension (National Reading Panel, 2000). For the purpose of the current study, comprehension is defined as the correct answer to an aided or “wh” question. The purpose for using “wh” questions is to assess factual information or literal comprehension questions that have a definite answer and are considered to be pre-requisites for answering higher-order thinking, or critical thinking, questions.

Curriculum-based Assessment

Curriculum-based assessment is commonly defined as a method to determine “the instructional needs of a student based upon the on-going performance within the existing course content in order to deliver instruction as effectively and efficiently as possible”
Curriculum-based assessment is different from curriculum-based measurement in both purpose and result (Burns, MacQuarrie, & Campbell, 1999). CBA is a valid (Burns & Mosack, 2005) and reliable method (Burns, Tucker, Frame, Foley, & Hauser, 2000) founded on long-established principles of effective instruction and assessment and is not a fad but sound principles of effective instruction and assessment (Tucker, 1987). Curriculum-based assessment seeks to answer the questions:

1. What does the student know?
2. What can the student do?
3. How does the student think?
4. How does the student approach tasks he or she is unsure of?
5. Now, what does the teacher do (Gravois & Gickling, 2002a, 2002b)?

Drill Sandwich

Conceptually, the Drill Sandwich (Coulter & Coulter, 1989) method is based on the idea that interspersal (Neef, Iwata, & Page, 1977) of known and unknown words leads to higher rates of retention than 100% unknown words (Browder & Shear, 1996; Burns & Boice, 2009; Cooke, Guzaukus, Pressley, & Kerr, 1993; MacQuarrie et al., 2002; Shapiro, 1992). In the Drill Sandwich method, known and unknown material are interspersed at a ratio of 70% known to 30% unknown. Operationally, the Drill Sandwich method has been defined in research as KKKUKKUKU. Procedurally, (a) a different known word is placed on an index card for each K, (b) a different unknown word is placed on an index card for each U, (c) the cards, in KKKUKKUKU sequence, are looped through three times. After the sequence has been looped through three times,
(d) the previous unknown words are placed into the K spaces, (e) three new unknown words are placed into the U spaces, and (f) the entire sequence is repeated three times. After the sequence has been looped through three times, (g) the then new unknown words are added into the K spaces, (h) new unknown words are added to the U spaces, and (i) the sequence is looped through three times.

Esperanto

The Esperanto language is an international language comprised from a number of different Western European languages (Richardson, 1988). Esperanto has been used in research to control for prior knowledge or exposure (MacQuarrie et al., 2002).

Fluency

LaBarge and Samuels (1974) define fluency as “one whose decoding processes are automatic requiring no conscious attention.” Within curriculum-based assessment, fluency is connected to the concepts of automaticity and accuracy. Fluency is defined as the natural rate at which a child reads when he or she knows all of the words in text. Tan and Nicholson (1997) found poor readers, 7 to 10 years old, who were trained with flash cards for “quick and accurate decoding of words,” showed an increase in comprehension.

Information Processing Model

The information processing model (Atkinson & Schiffrin, 1968) suggests that our sensory input is sent into our sensory register where information enters our working memory. Our working memory has limited capacity (Miller, 1956; Wolf, 1993) and requires repetition or rehearsal (Gates, 1930; Hargis, Terhaar-Yonkers, Williams,&
of new information to retain new information in long-term memory (Schunk, 1999).

The Incremental Rehearsal Method

Tucker (1989a) defined the Incremental Rehearsal method as a strategy that systematically lengthens the student’s practice interval when learning new material and suggested the introduction of a single new item at a time at a ratio of 10% acquisition and 90% maintenance based on Betts (1946) and Gickling and Havertape’s (1981) ratio for drill and practice. The Incremental Rehearsal method provides a high number of repetitions (Gates, 1930; Gickling & Havertape, 1981), gradual introduction of unknown information, a high degree of success from high ratio of known material (Hargis, 1987), and spacing in order to move previously unknown material from short-term memory to long-term memory (Browder & Shear, 1996; MacQuarrie et al., 2002). Incremental Rehearsal also allows for multi-step error correction, student control of the pace, student control of the cards, student response versus teacher response, and large number of responses (Browder & Shear, 1996).

The Incremental Rehearsal (Tucker, 1989a) method starts with a presentation of an unknown word (U) and gradually intersperses known words (K), for example, U; UK; UKK; UKKK; UKKKK; UKKKKK; UKKKKKK; UKKKKKKK; UKKKKKKKK. When the next unknown word is introduced, it takes the unknown, U, position. The previously unknown word becomes the first known, K, and the previous first known moves into the second known position, K2, etc.
The Instructional Level

Originally conceptualized by Vygotsky (1935; 1978), the “Zone of Proximal Development” is referred to as the zone where a student has independent skills yet where the student also needs some assistance. This concept was extended by Betts (1946) to the idea of an instructional level, which is familiar material with a small degree of challenge; independent level, which is too little challenge; and frustrational level, which is too great a challenge. Gickling and Havertape (1981) further extended the conceptual ideas into corresponding percentages for reading material. They defined instructional level as tasks or reading material consisting of 93-97% known words; independent level was defined as 98-100% known words; and frustrational level was defined as less than 93% known words. This condition resembles the transition stories originally used (Gickling & Havertape, 1981) and have been referenced as “a powerful tool to achieve rapid improvement in reading accuracy and fluency” (Tucker, 1989b, p. 23).

Interference Effect

An interference effect is when the process of rehearsal of information from short-term memory to long-term memory is interfered with and prevents the new information from moving into long-term memory. An interference effect might be a shift in attention, time delay, or introduction of too many new pieces of information at one time such that none receives sufficient repetition or rehearsal to secure in long-term memory (Schunk, 1999).
Interspersal

Conceptually, interspersal is the idea that rehearsing known and unknown material together leads to greater acquisition and retention (Neef et al., 1977). Specifically designed interspersal methods may take into account the instructional level for drill and practice of 70-85% (Gickling & Rosenfield, 1995) in the ratio of known to unknown material, for example, the Incremental Rehearsal method (90% known to 10% unknown) or the Drill Sandwich method (70% known to 30% unknown).

Multi-element Research Design

A multi-element research design is a single-case design that allows the researcher to compare multiple conditions by alternating the conditions, and then visually observing the differentiation of response, to determine a functional relationship between the independent variable and dependent variable (Kennedy, 2005). An advantage of multi-element research designs is the ability to compare multiple conditions; additionally, the “rapid alteration between conditions allows the analytic process to unfold rapidly when compared to other designs” while “interaction effects” and behavior which “cannot be reversed by the withdrawal of the intervention” are cited as disadvantages (Kennedy, 2005, p. 149).

Opportunity to Respond

Higher numbers of opportunities for the student to respond or opportunities to respond (OTR) have led to higher retention rates (Greenwood et al., 1984). Research on methods using the highest opportunity to respond, such as the Incremental Rehearsal
method, has shown that OTR mediates expectations based on verbal ability or intelligence (Burns & Boice, 2009; MacQuarrie et al., 2002).

The Pocket Word Method

Conceptually, the Pocket Word method (Grant & Hickey, 2007; Gravois & Gickling, 2002b) is a tool for honoring the developmental limits of working memory (acquisition rate) and providing sufficient repetition and practice. The Pocket Word method (Gravois & Gickling, 2002b) is used within the Instructional Consultation Team (ICT) model. According to Grant and Hickey (2007), the Pocket Word method “is primarily used as a tool to build word recognition skills for struggling readers; however, the method can also be applied to spelling, math, and key vocabulary terms” (pp.6-7).

The Pocket Word method has been recommended for ease of use and efficiency, is reported to take less time to use than either the Drill Sandwich or Incremental Rehearsal methods (T.A. Gravois and E.E. Gickling, personal communication, May 9, 2006), and teachers have rated satisfaction with its use (Gravois & Vail, 2003). For the purpose of this study, the description has been taken directly from the ICT manual, “The Pocket Word method involves cutting a three-by-five card into four equal pieces. Each unknown word is placed on a separate piece. The student, teacher, teacher aid, fellow student, parent volunteer, member of the staff can ask the student to review his pocket words, providing enough repetition and spaced practice for the student to master each new word” (Gravois & Gickling, 2002b, p. G2).
Repeated Reading

Samuels (1979) found that repeated readings assist accuracy, fluency, and expression. Moyer (1982) has long used repeated readings within the Read Naturally program; Chard, Vaughn, and Tyler (2002) have found an improvement in automaticity when repeated reading is used (Chard et al., 2002); Therrien (2004) has found that repeated reading has an impact on comprehension (effect size .76 with the same passage and .50 within a new passage) as well as fluency (Hattie, 2009). Research has shown the effect of repeated readings on oral reading fluency; in addition, repeated reading within passages of 50-300 words at the instructional level has been recommended as best practice (Joseph, 2008).

Repeated Reading at the Instructional Level

Each student has a 50-word reading passage created specifically for them which contains 48 known words and 2 unknown words from their Dolch Word List. The students are instructed to “Do your best reading” and read the passage three times.

Retell

Retell is the number of words provided in response to “Tell me what you read.” One way to assess comprehension is through written or oral retell. Students studied previously (Heilmann, Miller, & Nockerts, 2010) demonstrated that children under 6 years of age displayed 57-59 words stated in 1-3 minutes in narrative retell. In the same study, older students ages 6-13 years displayed 114-112 words stated in 1-3 minutes.
Retrospective

Retrospective research is a study in which one looks back at the data. A search was conducted for retrospective research involving reading instruction specific to word recognition with first-grade students. Millie Corrine Almy (1949) used retrospective data in her exploration of children’s experiences in early reading prior to first grade and subsequent success in beginning reading for her Ph.D. at the Teacher’s College. Gray (1958; see also Gray & Rogers, 1956) used interview and retrospective techniques with adult participants in regard to their reading. Between 1960 and 1970, there were 12 studies referencing retrospective data and each study was published in a professional journal. One such study was a retrospective study of 82 children with reading disabilities (Ingrim, Mason, & Blackburn, 1970). Between the years 1970-1980, again with the same search criteria, another 10 articles were located and all published in a professional journal. Between the years 1980-1990, using the same criteria, over 100 articles published in journals in the areas of medicine, psychology, psychiatry, and education were located. Between the years 1990-2000, over 500 related retrospective articles with a number of expanses of 20-30 years’ retrospective data in a single study were located. Between the years 2000 and 2010, over 2,000 articles referencing retrospective research using the above search criteria were noted.

Single-Case Design

The purpose of single-case design research is to study the individual behavior of a single person, using: (a) a high degree of experimental control, (b) operational definitions, (c) and an inductive approach to determine a functional relationship between the independent variable and the dependent variable (Kennedy, 2005). Advantages to the
use of single-case design research include: increased control, more accurate estimate of effect by individual, more observations, increased sensitivity, and causal relationship identified at the individual level for student specific results. Disadvantages to single-case design include weaker effects without experimental control and limits to external validity (Kennedy, 2005).

Traditional Drill

The Traditional Drill method is not a specially designed method of drill and practice. The traditional drill method involves writing a single unknown word on an index card for each of the unknown words. The words are placed into a pile and the 100% unknown words are practiced until a word becomes known. Once a word becomes known, the known word is removed from the pile and the 100% unknown words are again practiced. Research by Burns and Boice (2009) and MacQuarrie et al. (2002) has demonstrated that the Traditional Drill method is less effective for word retention than the Incremental Rehearsal or Drill Sandwich/Interspersal method; however, researchers have suggested the Traditional Drill method is effective due to shorter duration of administration (Cates et al., 2003; Joseph & Nist, 2006; Schmigdall & Joseph, 2007).

Words per Minute

There is contradicting direction from the field in regard to the procedures for collecting data on words per minute. There are differences in philosophy, belief, and practice around the process itself, definition of errors, formula for calculation, and wait time. For example, the operational definitions of wait time for the student to produce a complete word varies from “as soon as you know the student doesn't know the word” (J.
A. Tucker, personal communication, July 21, 2010), to 2 seconds (Burns, Dean, & Foley, 2004; Gickling & Rosenfield, 1995; Lagrou, Burns, Mizerek, & Mosack, 2006; Shinn, 1989), 3 seconds (Deno & Fuchs, 1987), and, within running records, 4-5 seconds (Clay, 1993). For the purpose of this study, students were asked to read a passage of 50 words within both the RR-IL condition and the generalization to Harcourt text. In the Harcourt text, students read their passage for 1 minute. Accuracy data as well as words per minute were recorded. Skipped words, incorrect words, and unknown words within 2 seconds were not counted in the number of words read. Words per minute were calculated by taking the subsequent number of words dividing by 60 seconds and multiplying by 60 as outlined by Burns, Dean, and Foley (2004).

Word Recognition

Automatic word recognition and meaning has been noted to free up resources for comprehension (LaBarge & Samuels, 1974), underlie comprehension (Stanovich, 1988; Stanovich, West, & Harrison, 1995), and lead to an increase in fluency and comprehension (Carnine, Silbert, Kame’enui, Tarver, 2004; Tan & Nicholson, 1997).

Working Memory

Working memory is conceptualized within the Information Processing model and has been defined as a “stage corresponding to awareness or what one is conscious of at a given moment” (Schunk, 1999, p. 348). Miller (1956) suggested a capacity for working memory of seven, plus or minus two, bits of information for adults; while Wolf (1993) suggested capacity ranges by developmental age, that is, one bit at 3 years, two bits at 5 years, three bits at 7 years, four bits at 8 years of age. Furthermore, repetition or
rehearsal has been noted as one way to move new information from working memory to long-term memory, and Gates (1930) has suggested 35 repetitions for a child of average intelligence.

Assumptions Inherent Within the Study

The major assumption within this study is that student learning can be effectively measured within an applied setting. In addition, secondary assumptions include: (a) that receptive vocabulary can be measured with reliability and validity using the Peabody Picture Vocabulary Test: Fourth Edition; (b) that a multi-element research design is a valid single-case design methodology (Kazdin, 1982; Kennedy, 2005; Kratochwill, 1992); (c) that visual analysis and descriptive statistics are valid approaches to the interpretation of multi-element and single-case design research (Kazdin, 1982; Kennedy, 2005); (d) that the formula for the determination of inter-rater reliability is valid; and (e) that the formulas for determining words read per minute and accuracy or percentage of known words out of total words in text in previous research are valid.

Limitations

One limitation of the study was with the year-round school schedule. The summer session ended the fourth week of July and allowed for a total of 15 data points per student. The timing of the data collection did not allow for a 30-day retention check as students were on break from school. While the order of students (first to last) was maintained throughout the study, the specific time of day the conditions were administered varied slightly from day to day due to fire drills, assemblies, and day-to-day variations in teacher schedules. Another limitation of the study was that the independent
assessment of the reliability of administration was conducted only once per condition due to lack of availability caused by summer vacation schedules.

**Delimitations**

One of the delimitations in this study is the small number of students who participated. The number of participants was intentionally kept small in order to provide support to the students with the greatest need. A second delimitation is that while prior knowledge was controlled by the three trials in the pre-test, students have likely had prior exposure to the words, which were recorded as incorrect versus controlled exposure, that is, Esperanto words. Therefore, learning within classroom materials was intentionally chosen over strict control of prior knowledge, even in light of prior critique by Semb and Ellis (1994). In addition, while an alternate version of the Harcourt text was used for generalization samples, there was no control of possible overlap with or between the teaching of unknown words during the administration of the study assessment and classroom instruction. The number of previously unknown words appearing in text was controlled by the district’s choice of text and the curriculum materials the students were expected to learn. Another delimitation of the study is that there are only five samples for each research condition as opposed to seven or more. While more samples would have added additional strength to the study, the number of sessions was controlled by the school calendar and pending summer vacation. In addition, the study did not move away from multiple trend data to a subsequent five samples with the most effective method for each student. Including five samples for each student with the most effective method would have allowed for continued examination of the response. While the acquisition rate was controlled for each student across each method, no comparison group without
controlling for acquisition rate was included. Previous research has shown less error and interference when the acquisition rate is used. Although conclusions about individual and group student responses to IR, PW, and RR-IL will be made, generalizations to all students, or populations of students, should be made with caution.

Organization

In the subsequent chapters, the reader will find a review of relevant literature, a description of methodology and participants, results and data, and conclusions and analysis. Chapter 2 connects the current study to previous studies, chapter 3 details the use of the multi-element design with participating students and the setting involved, chapter 4 describes the results for each research question posed, and chapter 5 analyzes the data described and details conclusions, recommendations, and suggestions for further study.
CHAPTER 2

BACKGROUND AND REVIEW OF THE LITERATURE

The purpose of this chapter is to review the theory, history, and foundational research behind the use of a single-case design research in the form of a retrospective multi-element study. This chapter also connects the reader to the umbrella of curriculum-based assessment, underlying principles of instructional level, ratio for drill and practice, and specifically designed interspersal methods.

Retrospective Research

Retrospective research is a study in which one looks back at the data. Retrospective research has historically been used in psychiatry and medicine around case review. A search was conducted for retrospective research involving reading instruction specific to word recognition with first-grade students, and results were located dating back to the 1950s. Millie Corrine Almy (1949) used retrospective data in her exploration of children’s experiences in early reading prior to first grade and subsequent success in beginning reading for her Ph.D. at the Teacher’s College. In 1958, Gray and Rogers used interview and retrospective techniques with adult participants in regard to their reading.

Between 1960 and 1970, in the area of reading instruction, word recognition, and first-grade students, there were 12 studies referencing retrospective data and each study was published in a professional journal. Between the years 1970-1980, again with the
same search criteria, another 10 articles were located and all published in a professional journal. Between the years 1980-1990, using the same criteria, over 100 articles published in journals in the areas of medicine, psychology, psychiatry, and education were located. Between the years 1990-2000, over 500 related retrospective articles with a number of expanses of 20-30 years’ retrospective data in a single study were located. Between the years 2000 and 2010, over 2,000 articles referencing retrospective research using the above search criteria were noted. A non-discipline-specific search for “retrospective research” yielded over 1 million research citations across disciplines and areas of study. As such, retrospective research has a long history in research and has been published in many professional journals. Retrospective studies are enhanced by the use of experimental control. As such, this study employs experimental control through the use of single case, and more specifically, multi-element design.

**Single-Case Design Research**

Single-case design research has a longstanding history. Behaviors of animals and individuals were recorded in the 1800s. Early learning experiments observed the behavior of a single subject. These observations often included repeated observations as well as a set of conditions. Early studies determined averages from the many observations, which led to a more stable estimate of behavior.

Ebbinghaus (1885; 1913; 1964) studied himself using data collection methods and ongoing observations of a single participant over time, and used a set of conditions. Ebbinghaus’s work has been published and shows his own graphing and charting of observation sessions on his own memory in his own penmanship. Ebbinghaus is an early example of an ongoing study with an individual subject.
In the 1950s, with the advent of inferential statistics, most professional publications required statistical testing in order to be published. Researchers with roots in single-subject design, for example, Thorndike and Pavlov, continued their studies. The experiments of Pavlov are common knowledge; however, each of their studies contains the critical element of experimental control and multiple observations over time or in a time-series. *The Journal of Experimental Analysis of Behavior* published single-subject research. In the 1960s, Sidman (1960) submitted a line of thinking to move back from group designs and inferential statistics to the foundation of single-subject research design, and the *Journal of Applied Behavior Analysis* continually published single-subject design research on applied problems (Kennedy, 2005). Currently, single-subject or single-case design research can be found in most professional journals.

As previously mentioned, the purpose of single-case design research is to study the individual behavior of a single person. The single individual serves as both the control and the experimental subject. Replication occurs both within study through the use of multiple trials, or as in this study, sessions of each condition. Replication also occurs across the replication of the same study and same experimental control with other participants. Single-case design research requires: (a) a high degree of experimental control, (b) operational definitions, and (c) an inductive approach to determine a functional relationship between the independent variable and the dependent variable (Kennedy, 2005). Advantages to the use of single-case design research include: increased control, more accurate estimate of effect by individual, more observations, increased sensitivity, and causal relationship identified at the individual level for student-specific results. In single-case design research, a functional relationship between the independent
variable and the dependent variable can be established for the individual as well as functional relationships from different individuals. Small details and observations may lead to new questions, which in turn can be explored using a new or revised single-case design. Disadvantages to single-case design include weaker effects without experimental control and limits to external validity (Kennedy, 2005).

**Multi-element Design**

Multi-element designs allow for the study of multiple interventions with a single participant over a short span of time. Experimental control can be determined if differentiation occurs with at least one condition. A disadvantage of multi-element designs is the possibility for interaction effects (Kennedy, 2005).

**Foundational Research**

Gickling and Havertape (1981) define curriculum-based assessment or instructional assessment as a procedure for determining the needs of a student, based upon ongoing performance within the course of the curriculum (Tucker, 1985). More specifically, curriculum-based assessment: (a) aligns assessment practices with what is actually taught in the classroom, (b) starts with what the student knows in building an integrated program, and (c) addresses the need to regulate task variability, task demand, and the pace of instruction to ensure student success (Gickling & Rosenfield, 1995).

Focusing on the known began with Betts (1946) who developed the original concept of instructional, independent, and frustrational levels. Gickling and Armstrong (1978), Gickling and Havertape (1981), and Gickling and Thompson (1985) suggest that task variability, task demand, and pace of instruction can be controlled by using the
proper ratio of known to unknown material or by teaching at the instructional level. As such, the instructional level for reading instruction is defined as a ratio of 93-97% known words to 4-7% unknown and for drill and practice (Gickling & Havertape, 1981; Gickling & Thompson, 1985).

The use of the instructional level has consistently demonstrated an increase in student learning (Gickling & Rosenfield, 1995; Gickling & Thompson, 1985; Roberts & Shapiro, 1996; Shapiro, 1992; Shapiro & Ager, 1992; Tomlinson & Kalbfleisch, 1998) for students with and without disabilities (Burns, 2002). Gickling and Armstrong (1978) studied 47 first-grade and second-grade students to determine which students were chronically functioning at a frustrational level and four first-grade and four second-grade students emerged. The first-grade students were between the ages of 6 and 7. The study compared task completion, task comprehension, on-task behavior, and how to design instructional, independent, and frustration level reading assignments. The study occurred over 15 sessions of intervention. During the instructional level sessions, the students showed “marked improvement across all three areas of observation,” “high degree of congruence occurred between each of the three variables,” and “produced an optimal learning situation for both groups” (Gickling & Armstrong, 1978, pp. 35-39).

Specifically, Gickling and Thompson (1985) found that controlling the curriculum to the suggested drill ratio of known to unknown items when rehearsing drill tasks led to increased task completion, task comprehension, and time on task. The same student showed that when the curriculum demand became either too easy (independent level) or too difficult (frustrational level), off-task behavior increased. Dickinson and Butt (1989) and Sprague, Sugai, and Walker (1998) also suggest that off-task behavior is a result of a
mismatch between the student’s level of prior knowledge (known material) and curriculum demand.

Neef et al. (1977) interspersed 50% known and 50% unknown spelling and sight words. The interspersal of known words led to an increased retention of unknown words, more so than during 100% unknown word drill. Neef, Iwata, and Page (1980) again used interspersal of known items for spelling words and found interspersal to be superior to baseline and high density conditions in acquisition rate, short-term and long-term retention. Early research on interspersal of acquisition (unknown) to maintenance (known) material suggested that students prefer interspersal (Neef et al., 1980) and have increased motivation with interspersal (Dunlap, 1984; Dunlap & Koegel, 1980).

In search of data to determine the optimal ratio of acquisition to maintenance items, Roberts, Turco, and Shapiro (1991) interspersed vocabulary words at ratios of 10% unknown to 90% known, 20%–80%, 40%–60%, and 50%–50%, and found that 50% to 50% and 40% to 60% ratios led to quicker learning. Less incidental learning was noted at higher rates of acquisition.

Additional studies add further variability in results, Cooke et al. (1993) and Cooke and Reichard (1996) suggested different instructional ratios for drill tasks in different academic areas (Burns, 2002). Cooke et al. (1993) examined 30% unknown to 70% known and 100% unknown ratios in spelling, multiplication, and passage fluency, and found that for spelling, 100% unknown was most effective; for multiplication 30% unknown to 70% known was most effective for generalization, and 100% unknown was quickest. Cooke and Reichard (1996) studied the 30% unknown to 70% known ratio and found that 30% unknown to 70% known led to increased retention over 50% known to
50% unknown or 70% unknown to 30% known for two students out of the six participants. However, the 70% unknown to 30% known condition led to a higher, more rapid learning and generalization of the math facts.

Burns (2002) conducted a meta-analysis of available research on drill ratios using the groupings <50% known, 50%-69% known, 70%-85% known, and 90% known, using 13 articles. The least challenging ratios resulted in strong mean effect size coefficients, with the most challenging ratio resulting in a small to moderate effect. Burns recommended interspersal of 50% acquisition and above and cautioned against higher ratios of acquisition (unknown) items.

**Interspersal Methods**

Coulter and Coulter (1989) were among the first to recommend a specific procedure for using interspersal for drill with flash cards. Coulter and Coulter’s method was based on a ratio of 30% acquisition items and 70% maintenance items. Coulter entitled the method the Drill Sandwich, using a process of folding in, specifically, KKKUKKUKKU. The Drill Sandwich is defined as presenting known (previously mastered by the student) to unknown (not yet mastered by the student) in the above sequence.

**Incremental Rehearsal Method**

Research on the Incremental Rehearsal method has moved beyond a discussion of ratio of presentation to center on word retention, acquisition rates, generalization within reading fluency, and comprehension, as well as on the relationship to on-task and off-task behavior. In our original study of retention, MacQuarrie et al. (2002) compared the
Incremental Rehearsal method (10% acquisition to 90% maintenance), the Drill Sandwich method (30% acquisition to 70% maintenance), and traditional (100% acquisition) presentation methods, using flash cards to teach Esperanto words to third- and seventh-grade students. We found that the Incremental Rehearsal method was more effective than the Drill Sandwich or the traditional methods, across both grade levels and throughout retention checks at 7 and 30 days. We found that the higher opportunity to respond led to higher rates of retention. Burns and Boice (2009) replicated the MacQuarrie et al. (2002) study with 20 seventh-grade and eighth-grade students eligible for receiving specially designed instructional services through an IEP and who had previously measured ability within the range of 61-85 ($M=74.40$). The researchers compared the Incremental Rehearsal method (Tucker, 1989a), the Traditional Drill method, and the Drill Sandwich method (Coulter & Coulter, 1989) in regard to the number of words retained at 1 and 2 weeks. The number of words retained for the IR condition was “more than two- to three-times the number of words retained for the other two conditions” (Burns & Boice, 2009, p. 289). At 14 days, the number of words retained for IR was .20 per minute, TD was .10 per minute, and Interspersal was .08 per minute. The study found “little relationship between IQ and the IR method” (p. 289).

Further studies confirmed that the method with the highest opportunity to respond, the Incremental Rehearsal method, led to the highest retention rate. Burns (2007) used high opportunities to respond and moderate variations of the Incremental Rehearsal method to teach unknown sight words to a child with mental retardation. Burns found that the high opportunity to respond led to the highest retention rate (i.e., 72-92%).
However, when OTR was controlled, the IR method continued to have the highest retention rate as in the study by Nist and Joseph (2008).

Nist and Joseph (2008) compared the Incremental Rehearsal method, a more challenging ratio of known to unknown interspersal procedure, and the Traditional Drill method with six first-grade students for efficiency (cumulative words retained by instructional minute) and effectiveness (cumulative words read accurately after 24 hours). The results indicate 112 words read with the Traditional method, 127 words read with the Interspersing method, and 150 words read with the Incremental Rehearsal method. In addition, the results indicate 92 words were maintained with Traditional, 109 words maintained with Interspersing, and 137 words maintained with the Incremental Rehearsal method. Thus, even when OTR was constant, the Incremental Rehearsal method demonstrated a higher number of words read and a higher number of words maintained.

In another study which included generalization measures, Burns (2002) used the Incremental Rehearsal method to intervene with elementary school students, including a general-education student with reading difficulty, a general-education student with difficulty in mathematics, and a special-education student with reading difficulty. The researchers noted that Student 1 showed improvement from an average of 35 words-per-minute to over 60 words-per-minute after the Incremental Rehearsal method was used to teach unknown words via a peer tutor. The researchers noted that student 2 showed improvement from multiplication digits correct of 50-78% to 70-85% correct with the last two measures at 92 and 91% correct when using the Incremental Rehearsal method to teach math facts. Student 3 showed improvement from baseline reading probes of 80-
85% of words known to a final three probes of 97%, 99%, and 98% words known using the Incremental Rehearsal method to teach unknown words.

Additional studies have examined different ratios for pre-teaching unknown words and effects on fluency. Burns and Dean (2002) used ratios of 1U/9K, 1UK/5K, and 2UK/2K during pre-teaching of unknown words to students with learning disabilities. The researchers found that pre-teaching with the Incremental Rehearsal method (1UK/9K) led to increased reading fluency.

Burns, Dean, and Foley (2004) extended the exploration of the Incremental Rehearsal method to explore the effect on both fluency and comprehension. The authors pre-taught unknown words using the Incremental Rehearsal method to 20 students with learning disabilities. Burns, Dean, and Foley found effect sizes of .38 in reading fluency and 1.76 in comprehension. Burns (2007) explored the effect of pre-teaching unknown words to 29 third-grade students identified as learning disabled on instructional level using reading fluency. The researcher found that pre-teaching unknown words led to increased instructional level reading as well as increased reading-fluency gains.

Additional studies extended the research to examine the effect of different ratios on recall and on-task behavior. Burns and Dean (2005a) explored the use of four drill ratios (0% known, 50% known, 83% known, and 90% known) for the impact on recall and on-task behavior with 5 fourth-grade students. They found that the 90% known condition corresponded to the highest resulting on-task behavior.

In addition, researchers have suggested the evaluation of the Incremental Rehearsal method and Traditional Drill methods in terms of efficiency (Cates et al., 2003) or the number of words learned divided by the amount of instructional time.
(Joseph & Nist, 2006; Nist & Joseph, 2008) or learning level divided by instructional time (Cates et al., 2003; Skinner, Belfiore, Mace, Williams, & Johns, 1997; Skinner, Belfiore, & Watson, 2002).

Recently, Burns and Sterling-Turner (2010) conducted a study in which the IR method and the TD method were used to teach Esperanto words to 25 fourth-grade students and compared to each other using different measures of efficiency. The students retained 23.3% of the words taught with the TD and 67.3% with the IR condition; the students required 3.52 minutes for TD and 8.90 minutes for IR; 7-day retention for TD was .43, and .46 for IR when retention was used. The researchers found that IR was most efficient for 16 students and TD most efficient for nine. The researchers concluded that while it was difficult to determine which method was most efficient, the IR method “required 2.5 times more instructional time than” the TD method but was “almost 3 times as effective” (p. 132). The authors further suggested that re-teaching time be added into the efficiency data when words are not retained.

As such, critique of the Incremental Rehearsal method has included the time for training of a teacher, variability of teacher ease of use, and amount of administration time (Burns, 2007). In response to this criticism, Gravois and Gickling (2002b; personal communication, May 9, 2006) have suggested the use of the Pocket Word method. In addition, it has been suggested that the PW is more effective than IR, takes less time to administer, and students can engage in the activity with a teacher or with peers (Gravois & Gickling, 2002b).
The Pocket Word Method

Conceptually, the Pocket Word method (Grant & Hickey, 2007; Gravois & Gickling, 2002b) is a tool for honoring the developmental limits of working memory (acquisition rate) and providing sufficient repetition and practice. The Pocket Word method uses peer-to-peer interaction which conceptually connects to Vygotsky’s social learning theory. The Pocket Word method (Gravois & Gickling, 2002b) is used within the Instructional Consultation Team (ICT) model. According to Grant and Hickey (2007), the Pocket Word method “is primarily used as a tool to build word recognition skills for struggling readers; however, can also be applied to spelling, math, and key vocabulary terms” (pp. 7-8).

The Pocket Word method has been recommended for ease of use and efficiency, is reported to take less time to use than either the Drill Sandwich or Incremental Rehearsal methods (Todd Gravois & Ed Gickling, personal communication, May 9, 2006), and teachers have rated satisfaction with its use (Gravois & Vail, 2003). For the purpose of this study, the description has been taken directly from the ICT manual:

The Pocket Word method involves cutting a three-by-five card into four equal pieces. Each unknown word is placed on a separate piece. The student, teacher, teacher aid, fellow student, parent volunteer, member of the staff can ask the student to review his pocket words, providing enough repetition and spaced practice for the student to master each new word. (Gravois & Gickling, 2002b p. G2)

In a recent study, Kaiser, Rosenfield, and Gravois (2009) studied teacher satisfaction, skill development, and skill application subsequent to Instructional Consultation Team cases. All cases analyzed occurred within the Instructional Consultation Team model, 274 kindergarten through fifth-grade teachers in 27 school districts were studied, and within those districts buildings were reported to be at various
points of implementation of the Instructional Consultation model. Results from the implementation scale and surveys administered indicated that over 90% of teachers reported being “highly satisfied to satisfied,” 80% learned one or more new skills or strategies, and learned more academic strategies than behavior. The Pocket Word method was listed as one of the most frequently cited strategies learned within the Instructional Consultation Team case consultation. Given the amount of use and teacher reports, the Pocket Word method warrants study using an experimental design.

Repeated Reading at the Instructional Level

Originally conceptualized by Vygotsky (1935; 1978), the “Zone of Proximal Development” is referred to as the zone where a student has independent skills yet where the student also needs some assistance. This concept was extended by Betts (1946) to the idea of an instructional level, which is familiar material with a small degree of challenge; independent level, which is too little challenge; and frustrational level which is too great a challenge. Gickling and Havertape (1981) further extended the conceptual ideas into corresponding percentages for reading material. They defined instructional level as tasks or reading material consisting of 93-97% known words; independent level was defined as 98-100% known words; and frustrational level was defined as less than 93% known words. This condition resembles the transition stories originally used (Gickling & Havertape, 1981) and have been referenced as “a powerful tool to achieve rapid improvement in reading accuracy and fluency” (Tucker, 1989b, p. 23). For the purpose of this study, each student had a 50-word reading passage created specifically for them which contained 48 known words and 2 unknown words from their Dolch Word List. The students were instructed to “Do your best reading” and read the passage three times.
CHAPTER 3

METHODOLOGY

The purpose of this chapter is to detail the research methodology employed for this study and to provide detailed descriptions of participants and setting, dependent variable, experimental intervention, limitations, delimitations, materials, experimenter training, and benefits of the study.

Participants and Setting

Huron Valley is one of 28 school districts in Oakland County, Michigan. Oakland Schools is the Intermediate School District which serves and supports each of the 28 local districts. The Huron Valley Public Schools district staff and Kurtz Elementary School staff were interested in exploring research-based assessment and instructional practices for at-risk students in the first grade. The district uses the Dolch Word List and maintains an expectation of mastery with students by grade level. The district posed the question, “Which instructional method would assist in most effectively teaching the Dolch words to first-grade students?” As the research began through district consultation and problem-solving, the data collected herein are included as retrospective data.

The Kurtz Elementary School population consists of 92% White, 3% Asian American, 2% Hispanic, 1% Black, and 1% American Indian students. Kurtz Elementary School has 22% participation in the Free and Reduced Lunch program. The staff at Kurtz
Elementary School sent informed-consent letters to the homes of all of the students within the first grade year-round classrooms at Kurtz Elementary School in Michigan. All students who returned a consent form, signed by the appropriate individual, participated in the administration of a pre-assessment consisting of three repeated screenings of known words (known within 3 seconds) on the Dolch Word List (Dolch, 1948).

**Selection of the Participants**

The students with the fewest average number of known words on the Dolch Word List (Dolch, 1948) participated in this study. The seven students in the first grade who scored in the lowest 25% on the pre-assessment, using the Dolch list, were selected for participation. The lowest scoring students were administered the PPVT-IV, and students with scores above 80 were eligible for participation in the study. This limitation was imposed as a screener in order to ensure that the study was carried out with students who did not demonstrate any type of cognitive impairment.

**Screening**

Participants were screened for verbal ability using the Peabody Picture Vocabulary Test Fourth Edition (Dunn & Dunn, 2007). The PPVT-IV was selected as a measure of receptive vocabulary, which is a major aspect of verbal ability (Dunn & Dunn, 1981). While an earlier edition of the Peabody Picture Vocabulary Test was correlated with measures of verbal intelligence, the most recent edition, the Peabody Picture Vocabulary Test: Fourth Edition has not. The PPVT III was found to have a .91 and .92 correlation coefficient for Form A and B, respectively (Dunn & Dunn, 2007). The
Peabody Picture Vocabulary Test: Fourth Edition has a .84 correlation coefficient with the PPVT-III.

**Description of the Participants**

Student 1, a 7-year, 4-month-old White male, participated in this research study. He was not identified as a student with a disability. However, he did receive weekly intervention services two times per week for 30 minutes per session throughout his first-grade year from the special education resource teacher. Student 1 received a standard score of 98 (SS=98) on the PPVT-IV.

Student 2, a 7-year, 7-month-old White female student, participated in this study. She was identified as a student with a disability in the area of speech and language according to the Michigan criteria for Speech and Language Impairment (Michigan Department of Education, 2009). She received special education services twice a week for 30 minutes from the school Speech and Language pathologist. Student 2 received a standard score of 103 (SS=103) on the PPVT-IV.

Student 3, a 7-year, 3-month-old White female student, participated in this study. She was identified as a student with a disability in the area of speech and language according to the Michigan criteria for Speech and Language Impairment (Michigan Department of Education, 2009). She received special education services twice a week for 30 minutes from the school Speech and Language pathologist. Student 3 received a standard score of 89 (SS=89) on the PPVT-IV.

Student 4, a 7-year, 10-month-old African American male student, participated in this study. He was identified as a student with a disability in the area of speech and language according to the Michigan criteria for Speech and Language Impairment
(Michigan Department of Education, 2009). He received special education services twice a week for 30 minutes from the school Speech and Language pathologist. Student 4 received a standard score of 98 (SS=98) on the PPVT-IV.

Student 5, a 6-year, 11-month-old Hispanic male student, participated in this study. He was not identified as a student with a disability. He did not receive intervention services from the Special Education teacher. Student 5 received a standard score of 102 (SS=102) on the PPVT-IV.

Student 6, an 8-year, 2-month-old White male student, participated in this study. He was not identified as a student with a disability. He did not receive intervention services from the Special Education teacher. Student 6 received a standard score of 119 (SS=119) on the PPVT-IV.

Student 7, a 6-year, 1-month-old Asian student, participated in this study. He was not identified as a student with a disability. He did not receive intervention services from the Special Education teacher. Student 7 received a standard score of 118 (SS=118) on the PPVT-IV.

**Dependent Variable**

Twenty-four hours after each condition was administered, the students had retention or number of words retained checked. Retention checks also occurred 7 days after each administration.

Because word recognition and meaning is connected to fluency, student responses were assessed for words read per minute in generalized passages from the district grade-expected Harcourt text after each condition. Twenty-four hours after each condition was
administered, students were given a reading passage from the Harcourt text to assess generalization in grade-expected text.

Because word recognition and meaning is also connected to comprehension, retell was assessed after each passage and the reading responding continuum was used to assess: (a) the number of word responses to narrative retells, for example, “Tell me what you read,” and (b) the percentage of correct responses to five aided questions, “Who, What, When, Where, How?”

**Experimental Intervention**

The three-trial method (Gravois & Gickling, 2002a) was used to assess known (student says the word within 3 seconds) and unknown words (student does not say the word within 3 seconds) from the Dolch Word List (1948). The Dolch Word List (Dolch, 1948) was used as pre-assessment. Thorndike (1921) created a list of 10,000 sight words that students should know. Dolch later condensed the list to 220 words, which represented 50% of the words found in children’s literature in 1936. As such, may districts, including the Huron Valley Public Schools, currently use the Dolch list (Dolch, 1948).

The defined three-trial method for collecting baseline for discrete skills includes:

1. Place words on the right in a known stack which are known immediately (within 3 seconds) and words on the left that are unknown or hesitant (unknown within 3 seconds).

2. Using items only in the right stack (knowns), assess the student again. If the student knows the word, place it in the stack on the right, if unknown, it is placed on the left.
3. Using items only in the right stack (knowns), assess the student again. If the student knows the word, place it in the stack on the right, if unknown, it is placed on the left.

The assessment and administration of conditions was conducted outside of the first-grade classroom in a small office. The office was located adjacent to the classroom. The office contained two chairs and a kidney-shaped table. One student was in the office with the researcher at a time and no other adults were present. Of the students assessed using the three trial method with the Dolch Word List, the seven students with the lowest number of known words on the Dolch Word List were included in the study.

For the seven students with the lowest number of known words on the Dolch Word List, acquisition rates were assessed using the Incremental Rehearsal method per the steps identified by Burns (2001). The acquisition rates ranged between 2 and 4. The mean acquisition rate was 2.71 ($M=2.71$) and standard deviation was .76 ($SD=.76$). The acquisition rates that occurred most frequently were 2 and 3.

For the seven students with the lowest number of known words on the Dolch Word List, PPVT-IV data and acquisition rates for each student were obtained. The PPVT-IV data and acquisition rates are included in Table 2. Once an acquisition rate was obtained for each student, three conditions were administered in random order for each student to counterbalance possible effects (Kratochwill, 1992).
Table 2

_Acquisition Rate and Peabody Picture Vocabulary (PPVT) Age-Based Standard Score (SS) for Each Student_

<table>
<thead>
<tr>
<th>Student</th>
<th>Chronological Age</th>
<th>Acquisition Rate</th>
<th>PPVT-IV (SS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>7 Years, 4 Months</td>
<td>3</td>
<td>98</td>
</tr>
<tr>
<td>Student 2</td>
<td>7 Years, 7 Months</td>
<td>3</td>
<td>103</td>
</tr>
<tr>
<td>Student 3</td>
<td>7 Years, 3 Months</td>
<td>2</td>
<td>89</td>
</tr>
<tr>
<td>Student 4</td>
<td>7 Years, 10 Months</td>
<td>2</td>
<td>98</td>
</tr>
<tr>
<td>Student 5</td>
<td>6 Years, 11 Months</td>
<td>2</td>
<td>102</td>
</tr>
<tr>
<td>Student 6</td>
<td>8 Years, 2 Months</td>
<td>4</td>
<td>119</td>
</tr>
<tr>
<td>Student 7</td>
<td>6 Years, 1 Month</td>
<td>3</td>
<td>118</td>
</tr>
</tbody>
</table>

_Note._ Acquisition rate is the number of bits of new information that can be learned at one time.

The Incremental Rehearsal Method

In the first condition, the Incremental Rehearsal method (Tucker, 1989a) was administered using nine known words and introducing the number of unknown words which corresponded to the child’s acquisition rate, for example, U; UK; UKK; UKKK; UKKKK; UKKKKK; UKKKKKK; UKKKKKKK; UKKKKKKKK; UKKKKKKKKKK. Each word was written on a 3X5 index card without including the answer. The first unknown word was presented by the assessor reading the word, providing a one-word definition, asking the child to spell the word, and asking the child to use the word in a sentence. “Hi, today we are going to learn some words together. Our first word is (kind). (Kind) means (nice). Now, spell (kind). Student spells kind while looking at the index card. Good. Now, use (kind) in a sentence. Student uses kind in a sentence. Good.” Then, the unknown word was presented in the sequence attached (Appendix A). The number of
cards remained 10 and the ratio remained 90% known and 10% unknown. On average, the IR method took 10-12 minutes.

**The Pocket Word Method**

In the second condition, the Pocket Word strategy (Gravois & Gickling, 2002b) was administered using the number of unknowns which corresponded to the student’s acquisition rate. I cut a 3X5 index card into four equal pieces, each unknown word was placed on a separate piece, and I: (a) stated the word, and (b) provided a one-word definition. The student was then asked to: (c) spell the word, and (d) use the word in a sentence. “**Hi, today we are going to learn some words together. Our first word is (kind). (Kind) means (nice). Now, spell (kind).**” The student spells kind while looking at the index card. **Good. Now, use (kind) in a sentence.** Student uses kind in a sentence. **Good.**” The student was then asked to put his or her pocket words into their pocket and to “Show your pocket words” to nine different individuals outside of his or her own classroom. If an individual was approached for showing pocket words and did not ask to see the student’s pocket words, the researcher directed the individual to state only, “**Show me your pocket words.**” On average, the Pocket Word method took 6-10 minutes.

**Repeated Reading in Instructional Level Text**

Finally, the third condition was repeated reading within instructional level text (RR-IL). In this condition, the known words (words read correctly within 3 seconds), identified through the three-trial method, were written into an instructional level passage of 93-97% known words from the pre-test with the Dolch Word List. As such, there were 48 known words and two unknown words selected from the Dolch Word List and written
into a 50-word passage. A new 50-word passage with 48 known words and two unknown words was written individually for each student for each RR-IL condition. As such, 7 passages were written for each of the five RR-IL conditions for a total of 35 individualized passages which were printed one passage to a page. The student was instructed “Now let’s read your passage. You will read it three times. Do your very best reading.” When the student is sitting up and ready to read. “Ready, begin.” The prompt, “One more time,” was used in the event the student forgot to reread the passage. The student was timed for 60 seconds on each reading using a stopwatch without a timer. The number of words read per minute was calculated for each reading. Omitted words, words read incorrectly, and words read after 2 seconds were not included. The number of words read per minute was computed by taking the subsequent number of words read, dividing by 60, and multiplying by 60 as defined in previous research by Burns, Dean, and Foley (2004).

Generalization into the Harcourt textbook was assessed 24 hours after each condition. The student read a pre-selected 50-word passage from the Harcourt textbook. The student was seated across from me in a small, quiet office area outside of the classroom. The student was greeted with, “Good morning. Today, let’s read a passage from your textbook. Do your very best reading. When the student was sitting up at the desk and ready to read, I stated, “Ready, begin.” I used a separate protocol and a timer without an alarm, and noted observations while the student read. When a student hesitated for 2 seconds before saying a word, the word was provided to the student and the student continued to read. Omitted words, words read incorrectly, and words read after 2 seconds were not included. The number of words read per minute was computed
by taking the subsequent number of words read, dividing by 60, and multiplying by 60 as defined in previous research by Burns, Dean, and Foley (2004).

Then, a retention check of previously taught words was conducted by stating, “Let’s take a look at the words we learned yesterday. What word is this?” Each word from the day before was shown to the student with the prompt “What word is this?” when needed. Words were marked as known or unknown on the back of the card. Once the student completed reading, the passage was removed and the student was asked to “Tell me what you read” and was given the prompt “Tell me more,” up to three times as needed. Student responses were recorded and the total number of words in retell was recorded. Then, the student was asked each of the five “Wh” questions. Student responses were recorded for each “Wh” question. A percentage of Aided Questions Correct was calculated for each student by taking the number of Aided Questions Correct and dividing by 5.

Each child was administered one condition (IR, RR-IL, PW) per day Monday, Tuesday, Wednesday, and Thursday. The conditions were administered in counterbalanced order with the order randomly determined. There were a total of 15 conditions administered, or five administrations for each condition. Retention of words taught was assessed after 24 hours and after 7 days. Generalization, reading within grade-expected text, was assessed 24 hours after each administration. The entire Dolch Word List (Dolch, 1948), as pre-assessed using the three-trial method, was post-assessed at the end of the study using the three-trial method. Descriptive statistics is used to assist with comparison of effects.
Materials

The Dolch Word List (Dolch, 1948) was used as pre-assessment. Thorndike (1921) created a list of 10,000 sight words that students should know. Dolch later condensed the list to 220 words which represented 50% of the words found in children’s literature in 1936. As such, many districts, including the Huron Valley Public Schools, currently use the Dolch Word List (Dolch, 1948).

Generalized reading passages were randomly selected from the Harcourt series used within the Huron Valley Public Schools. Care was taken to ensure that the particular text used was not yet taught in the class but would be the next/alternate text for the grade level. Passages for the instructional level condition contained 50 words and each passage was printed for each student. Three-by-five inch and 3x5 inch index cards, divided into four, were used with the typefont held consistent. Graphs were used to record the student’s known words (per Dolch list), unknown words retained, words read per minute, number of word responses to “Tell me what you read,” and percentage correct response to aided questions. Gravois and Gickling (2002b) use a Reading Retelling Profile to assess comprehension. At the unaided level, “Tell me what you read” was asked and the number of word responses was calculated. At the aided level, the same “Wh” questions (Who, What, Where, When) were asked to all seven students. In addition, WPM calculation charts were used.

Once unknown words and acquisition rates were identified, unknown words, that is, words not known in three consecutive trials, were placed onto flash cards for each student. The flash cards were grouped according to the student’s individual acquisition rate. For instance, if a student had an acquisition rate of two, then two unknown flash
cards were used for each condition. Flash cards were placed into bags for each of the administrations of the Incremental Rehearsal method, the Pocket Word method, or the Instructional Level text. Each bag was randomly assigned a sticker (i.e., red, blue, or yellow) and the counter-balance order was randomly drawn. The instructional level text contained no more than two to three unknown words.

**Intervention Fidelity and Inter-Observer Agreement**

Approximately 25% of the student-intervention sessions were observed and simultaneously coded by a school psychologist. According to Kennedy (2005), in lieu of a scientific standard, a range of 20-33% of sessions is suggested as preferable in current practice.

The observer monitored for correct procedural steps and both the researcher and observer timed and calculated procedural steps and words-read-per-minute calculations (i.e., timing, number of words read, number of errors made). For intervention fidelity, the number of agreements was divided by the number of agreements plus disagreements and multiplied by 100%. The IR method was 100%, the PW method was 100%, and the RR-IL method was 100%. Kazden (1982) states the minimum for inter-observer agreement is 80%. For inter-observer agreement on WRCM, agreement was 98%.

**Experimenter Training**

The experimenter for this study was a doctoral-level student in Educational Leadership at Andrews University. I have received instruction from Dr. Tucker on the Incremental Rehearsal method, implemented the method within the MacQuarrie et al. (2002) study, and have used the method in practice for more than 10 years. In addition, I
have received instruction from Dr. Gickling in both the use of the Pocket Word strategy and creating an instructional level.

**Experimental Design**

The first research question was analyzed with a cumulative acquisition design, and the other four research questions were examined with multi-element designs. These single-case designs were used because they can lead to acceptable internal validity but are applicable to applied settings such as schools (Riley-Tillman & Burns, 2009).

**Benefits of the Study**

The benefits to the student include building a word vocabulary, experiencing more success in reading, and possibly increasing reading words read per minute and oral retell. The benefit to the district includes data collection on the students currently not responding to intervention.

The benefit to the literature will be having extended the research on the Incremental Rehearsal method to applied data on the effectiveness of the Incremental Rehearsal method and the Pocket Word method in terms of students’ word retention, words-per-minute, and responding to unaided retell and aided questions. In addition, further student data would be provided with regard to the effectiveness of using acquisition rates in conjunction with Incremental Rehearsal, Repeated Reading at the Instructional Level, and Pocket Word strategies.

This study was conducted through a collaborative project between the ISD and one of the local school districts which evolved from a teacher question around effective ways to teach words. The data obtained herein were ex post facto. When the data were
collected as part of a school-district initiative, minors and their parents were asked to sign a form indicating consent. All information obtained by the research procedures was kept confidential, and names were not associated with data. There were no known risks posed to participants. Participants missed some class time, which did not exceed 30-45 minutes per session. Participants also worked one-on-one with the researcher in a quiet location other than their regular classroom or in the hallway during the PW condition, during that time. Student names were not used in conjunction with any data.

The results of the study were shared with the Huron Valley Public Schools staff and administration; however, results were provided without student names.
CHAPTER 4

RESULTS

The purpose of this chapter is to provide the results of the research conducted. The chapter begins with a review of the research questions and proceeds to a review of data pertaining to them.

Research Questions

The research questions posed were:

1. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on word retention of each student?

2. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on generalization of learned words within reading curriculum?

3. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on words read per minute for each student?

4. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on retell of grade-expected text?
5. What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on the percentage of correct responses to five aided questions, “Who, What, When, Where?”

Throughout this chapter, each question will be presented prior to the data, visual analysis, and narrative for that question.

**Research Question 1**

What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on word retention of each student?

**Word Retention**

The Dolch Word List assessment, administered prior to the administration of conditions, was referenced as “Pre.” The Dolch Word List assessment administered after the administration of all conditions is referenced as “Post” in Figure 1. The mean Dolch pre-test score was 93.29 with a range of 55 to 130. The mean Dolch post-test score was 152.43 with a range of 114 to 198. Figure 1 visually represents each student’s score on the Dolch pre- and post-test.

The Dolch Pre and Post shows an increase in number of words retained for all seven students. Altogether, the seven students retained 414 previously unknown words in 5 weeks. The average retention of unknown words per student was 59, with a range of 45 to 72. The average number of new words retained per week was 11.2, with a range of 9.0 to 14.4. Students 2 and 6 showed an increase of over 70 words; Student 7 showed an increase of over 60 words; Students 1, 3, and 4 showed an increase of over 50 words; and Student 5 showed an increase of 45 words. In terms of average words retained per week,
Students 2 and 6 gained 14.4 and 14.2 respectively, Student 1 gained 11.8, and Students 3, 4, and 5 gained 10.4, 10.4, and 9.0, respectively.

Word Retention by Condition: Descriptive Statistics

Table 3 highlights the descriptive statistics for each condition at 1 and 7 days.

![Figure 1. Dolch list pre- and post-word retention.](image)

Table 3

**Word Retention by Condition**

<table>
<thead>
<tr>
<th></th>
<th>IR</th>
<th>PW</th>
<th>RR-IL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>1 Day</td>
<td>2.54</td>
<td>0.85</td>
<td>2.51</td>
</tr>
<tr>
<td>7 Day</td>
<td>2.66</td>
<td>0.73</td>
<td>2.43</td>
</tr>
</tbody>
</table>

*Note.* Word Retention for IR, PW, and RR-IL at 1 and 7 Days. IR=Incremental Rehearsal; PW=Pocket Words; RR-IL=Repeated Reading at the Instructional Level.
The IR method had an increase in mean for the 7-day retention over the 1-day retention (2.54 to 2.66); the PW method had a decrease in mean from 1-day to 7-day retention (2.51 to 2.43); and the RR-IL method remained constant (1.6).

The data were examined for individual students through a cumulative acquisition design in the figures below. As shown in the figures, there appeared to be experimental control in comparing the RR-IL condition to the other two, but no differentiation between IR and PW. However, the PW condition was the lowest for one student for the 7-day retention assessment.

Figures 2 to 8 display visual representation of cumulative words retained after 24 hours by intervention by student. Figures 9 to 15 show a visual representation of cumulative words retained by intervention by student after 7 days.

*Figure 2. Cumulative words retained 24 hours (Student 1).*
Figure 3. Cumulative words retained 24 hours (Student 2).

Figure 4. Cumulative words retained 24 hours (Student 3).
Figure 5. Cumulative words retained 24 hours (Student 4).

Figure 6. Cumulative words retained 24 hours (Student 5).
Figure 7. Cumulative words retained 24 hours (Student 6).

Figure 8. Cumulative words retained 24 hours (Student 7).
Figure 9. Cumulative words retained 7 days (Student 1).

Figure 10. Cumulative words retained 7 days (Student 2).
Figure 11. Cumulative words retained 7 days (Student 3).

Figure 12. Cumulative words retained 7 days (Student 4).
Figure 13. Cumulative words retained 7 days (Student 5).

Figure 14. Cumulative words retained 7 days (Student 6).
Research Question 2

What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on generalization of learned words within reading curriculum?

Generalization in Harcourt Text: All Students’ Known Words

Known words within the generalized reading passages, Harcourt text, were analyzed for all seven students. Words that had been taught to each individual student using IR, PW, and IL were analyzed for their accuracy when read within text. The range for known words in text was a minimum of 50% and maximum of 100% correct (Range=50-100%). The mean percentage of IR, PW, and RR-IL words known in text was 85.25% ($M=85.25\%$) and standard deviation was 16.46 ($SD=16.46$). See Table 4.
Table 4

*Mean Percentage of Words Read Correctly in Generalized Harcourt Text by Condition*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR</td>
<td>18</td>
<td>0.00</td>
<td>100</td>
<td>72.4006</td>
<td>45.79330</td>
</tr>
<tr>
<td>PW</td>
<td>19</td>
<td>0.33</td>
<td>100</td>
<td>58.0447</td>
<td>50.28523</td>
</tr>
<tr>
<td>RR-IL</td>
<td>16</td>
<td>0.00</td>
<td>100</td>
<td>73.5119</td>
<td>44.09226</td>
</tr>
</tbody>
</table>

*Note.* IR=Incremental Rehearsal; PW=Pocket Words; RR-IL =Repeated Reading at the Instructional Level.

**Generalization in Harcourt Text: Individual Student Known Words by Student**

The data included in this section were not displayed experimentally. Previously unknown words, which are encountered within the Harcourt text at 24-hour generalization, were assessed to determine if the previously unknown word taught to the student using IR, PW, or RR-IL was read correctly. However, if the word did not appear within the Harcourt text, then that previously unknown word was not assessed. For student 1, of the words taught during IR, PW, or RR-IL conditions, 57 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 1 correctly read 89.5% correct during the generalization to Harcourt text. For Student 2, of the words taught during IR, PW, or RR-IL conditions, 22 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 2 correctly read 81.8% correct during the generalization to Harcourt text. For Student 3, of the words taught during IR, PW, or RR-IL conditions, 28 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 3 correctly read 50% correct during the generalization to Harcourt text.
For Student 4, of the words taught during IR, PW, or RR-IL conditions, 20 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 4 correctly read 90% correct during the generalization to Harcourt text. For Student 5, of the words taught during IR, PW, or RR-IL conditions, 64 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 5 correctly read 93.75% correct during the generalization to Harcourt text. The word “the” had a high frequency. For Student 6, of the words taught during IR, PW, or RR-IL conditions, 11 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 6 correctly read 100% correct during the generalization to Harcourt text. For Student 7, of the words taught during IR, PW, or RR-IL conditions, 12 were in the generalized passages read 24 hours after administration in Harcourt text. Of the words taught, Student 7 correctly read 91.6% correct during the generalization to Harcourt text.

**Research Question 3**

What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on words read per minute for each student?

**Generalized Words-per-Minute:**
Grade-Expected Harcourt Text

Words-per-minute was assessed for each student during the generalization measure administered 1 day after each condition using the district’s Harcourt textbook. Twenty-four hours after each administration of a condition (IR, PW, RR-IL), students were asked to read a passage from the district’s Harcourt textbook for 1 minute. Number
of words-per-minute was determined by taking the number of words and dividing by the
number of seconds and then multiplying by 60. Words read incorrectly or after 2 seconds
were not counted. At 2 seconds wait time, the student was provided with the word.

Words-per-minute of generalization passages in the Harcourt text were analyzed by
condition: IR, PW, or RR-IL. The descriptive statistics in Table 5 show RR-IL mean
words-per-minute as 48.57, PW mean words-per-minute as 44.71, and the Incremental
Rehearsal method with mean words-per-minute as 41.42.

### Table 5

**Generalization to Harcourt Text: Comparison of WPM by Condition**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR</td>
<td>35</td>
<td>16.9</td>
<td>72</td>
<td>41.4257</td>
<td>13.5250</td>
</tr>
<tr>
<td>PW</td>
<td>35</td>
<td>17.0</td>
<td>70</td>
<td>44.7140</td>
<td>14.07280</td>
</tr>
<tr>
<td>RR-IL</td>
<td>35</td>
<td>17.0</td>
<td>100</td>
<td>48.5714</td>
<td>18.67412</td>
</tr>
</tbody>
</table>

*Note.* IR=Incremental Rehearsal; PW=Pocket Word; and RR-IL=Repeated Reading-
Instructional Level.

**Student 1.** Figure 16 shows Student 1’s words read per minute within the Harcourt
text by condition across the 15 sessions. Student 1’s average words-per-minute for IR
was 22.78, PW was 24.99, and RR-IL was 24.8. Student 1’s words-per-minute range was
between 17 and 27 for IR, between 17 and 27 for PW, and between 17 and 29 for RR-IL.
Student 1’s median for IR was 24.00, for PW was 27.00, and for RR-IL was 26.00.
Student 1’s mode for IR was 24.00 and for PW was 27.00. Student 1’s average words-
per-minute within the Harcourt text was 24.19.
Figure 16. Generalization in Harcourt text by condition (Student 1).

Visually, there is no clear differentiation between conditions. Some variance in the data is noted, and it is observed that the last half of the data has a steeper incline for the IR and RR-IL methods over the 15 sessions. Data points show overlap across all three conditions. Student 1’s slope by condition over the 15 sessions was 1.0 for IR, 0 for PW, and 2.4 for RR-IL.

Student 2. Figure 17 shows Student 2’s words read per minute within the Harcourt text across the 15 sessions by condition. Student 2’s average words-per-minute for IR was 42.60, words-per-minute for PW was 44.40, and words-per-minute for RR-IL was 46.80. Student 2’s words-per-minute range for IR was 40-47, PW was 37-51, and RR-IL was 43-51. Student 2’s median for IR was 42.00, PW was 45.00, and RR-IL was 47.00. Student 2’s mode for PW was 45. Student 2’s average words-per-minute within the Harcourt text was 44.60.
Visually, there is no clear differentiation between conditions over the 15 sessions. Some variance in the data is noted with a slight increase over the first three data points. Data points show overlap between all conditions. Student 2’s line trended slightly down over the 15 sessions for IR, PW, and RR-IL. The slope for IR was .4, PW was 1.2, and RR-IL was .8.

Student 3. Figure 18 shows Student 3’s words read per minute within the Harcourt text across the 15 sessions by condition. Student 3’s average words-per-minute for IR was 37.40, PW was 44.00, and RR-IL was 42.40. Student 3’s words-per-minute range for IR was 30-46, for PW was 35-53, and RR-IL was 34-52. Student 3’s median for IR was 38.00, PW was 44.00, and RR-IL was 43.00. Student 3’s average words-per-minute within the Harcourt text was 41.27.
Visually, a slight differentiation of the IR method from the PW and RR-IL can be observed. Student 3’s line trended upwards over the 15 sessions for all conditions showing change in level. It is observed that the second half of the data is steeper than the first half. The slope was 3.2 for IR, 3.6 for PW, and 3.6 for RR-IL. Data points show overlap between conditions PW and RR-IL, showing a similar line with IR slightly lower with a similar trend.

**Student 4.** Figure 19 shows Student 4’s words read per minute within the Harcourt text across the 15 sessions by condition. Student 4’s average words-per-minute for IR was 29.60, PW was 30.20, and RR-IL was 33.40. Student 4’s words-per-minute range was 24-32 for IR, 25-35 for PW, and 21-38 for RR-IL. Student 4’s median for IR was 32.00, PW was 30.00, and RR-IL was 37.00. Student 4’s mode for IR was 32.00 and for IL was 38.00. Student 4’s average words-per-minute within the Harcourt text was 31.07.
Figure 19. Generalization in Harcourt text by condition (Student 4).

Visually, overlap between conditions and variance in the data can be observed. The PW method appears to have trended up, while the IR and RR-IL methods appear to have trended down. Student 4’s line trend was consistent and then downward for IR, upwards for PW, and straight with some variability for RR-IL. Student 4’s slope for IR was 1.6 trending down, 1.6 for PW, and 0 for RR-IL.

Student 5. Figure 20 shows Student 5’s words read per minute within the Harcourt text across the 15 sessions by condition. Student 5’s average words-per-minute for IR was 45.60, PW was 54.60, and RR-IL was 51.00. Student 5’s words-per-minute range for IR was 30-62, PW was 42-70, and RR-IL was 43-55. Student 5’s median for IR was 45.00, PW was 59.00, and RR-IL was 51.00. Student 5’s mode for PW was 42.00, and
RR-IL was 51.00. Student 5’s average words-per-minute within the Harcourt text was 50.40.

Visually, overlap and variance in the RR-IL and PW data are observed as well as change of level for the IR condition. Data are noted to be steeper for the second half than the first for IR and PW. Student 5’s slope was 5.8 for IR, 2 for PW, and .8 for RR-IL with all lines trending up. The IR method began lowest in the first session and showed the most gain from first to last session; the PW method showed greater variability, with PW ending up as highest data point on the last session; and the RR-IL method showed the least gain.

Student 6. Figure 21 shows Student 6’s words-per-minute within the Harcourt text across the 15 sessions by condition. Student 6’s average words-per-minute for IR was 59.60, PW was 61.80, and RR-IL was 80.20. Student 6’s words-per-minute range for IR
was 50-72, PW was 45-69, and RR-IL was 64-100. Student 6’s median for IR was 58.00, for PW was 65.00, and RR-IL was 77.00. Student 6’s average words-per-minute within the Harcourt text was 67.20.

![Graph showing generalization in Harcourt text by condition (Student 6).](image)

*Figure 21. Generalization in Harcourt text by condition (Student 6).*

Visually, the initial data points show more variance than subsequent data points. A drop in level is noted from the first three data points through the last three data points. Student 6’s line trended up for IR and PW and downwards for RR-IL until the last data point. Student 6’s slope was .8 for IR, 4.2 for PW, 4.6 for RR-IL. The PW method showed the most gain between the initial data points and final data points. The IR method showed the most growth between sessions 1 and 12.
Student 7. Figure 22 shows Student 7’s words read per minute within the Harcourt text across the 15 sessions by condition. Student 7’s average words-per-minute for IR was 52.40; PW was 53.00; and RR-IL was 61.40. Student 7’s words-per-minute range for IR was 46-58, PW was 49-57, and RR-IL was 55-73. Student 7’s median for IR was 55.00, for PW was 54.00, and for RR-IL was 60.00. Student 6’s mode for PW was 54.00. Student 7’s average words-per-minute within the Harcourt text was 55.60.

Figure 22. Generalization in Harcourt text by condition (Student 7).

Visually, there is overlap between conditions, some initial variance with RR-IL, and slight differentiation for RR-IL. Student 7’s slope was 1.6 for IR, .4 for PW, and 1 for IL. The IL method appeared to be most effective across 80% of the data points; the IR method was next effective with 60% higher data points than PW; and the PW method
was least effective with only 20% of data points above the IR method. The three methods show overlap between sessions 3 and 10.

**Research Question 4**

What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on retell of grade-expected text?

**Retell by Condition**

The Mean and Median number of words retold by condition for each condition were calculated and compared to each other. See Table 6.

**Table 6**

<table>
<thead>
<tr>
<th>Mean and Median Number of Words Retold by Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Rehearsal</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Student</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
</tbody>
</table>

*Note.* The number of words retold in response to “Tell me what you read” after reading generalized text.
In the unaided retell, the highest cumulative retell condition was the Pocket Word method for five of the seven students, the Repeated Reading at the Instructional Level method was highest for two of the seven students, and the Incremental Rehearsal method was had the highest cumulative retell for zero of the seven students.

Retell by Condition: Individual Student Graphs

Student 1. Figure 23 shows the number of word response to “Tell me what you read” for Student 1 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text was analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 19.40, after PW was 24.60, and after IL was 10.20. The median for IR was 23, PW was 23, and IL was 11. The mode for IL was 11.

Figure 23. Retell: “Tell Me What You Read” by condition (Student 1).
Visually, there appears to be overlap between sessions 5 and 7 as well as sessions 13 and 14 between the PW and IR methods. The RR-IL method appears to trend lower than the PW or IR methods. The PW and IR methods also appear to be at an increased level from RR-IL. All three lines, for each condition, trend upwards with the second set of data points steeper than the first for PW and IR.

Student 2. Figure 24 shows the number of words response to “Tell me what you read” for Student 2 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text was analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 21.00, after PW was 21.20, and after IL was 23.00. The median for IR was 21.00, PW was 20.00, and IL was 25.00. The mode for PW was 15, and RR-IL was 25.

*Figure 24. Retell: “Tell Me What You Read” by condition (Student 2).*
Visually, there appears to be overlap and variance within the data for three conditions. There is no clear differentiation between the methods. The IR and PW methods increase in level slightly and then trend back down between sessions 12 and 15. The PW method shows the steepest increase between session 8 and session 10, the IR method shows consistent data, while the IR-LL method shows an increase from session 2 to session 11 and then a decrease to session 15.

*Student 3.* Figure 25 shows the number of words response to “Tell me what you read” for Student 3 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text were analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 27.00, after PW was 32.00, and after RR-IL was 37.40. The median for IR was 25.00, PW was 32.00, and RR-IL was 31.00. The mode for PW was 32.

*Figure 25.* Retell: “Tell Me What You Read” by condition (Student 3).
Visually, there is overlap and variance in the data. While there is differentiation between both the RR-IL method and PW method, and the PW method and IR method between session 1 and session 6, there is a lack of differentiation between session 6 and session 15. The overall trend for the RR-IL method is a decrease, for IR is a decrease, and for PW is fairly consistent without an observable increase.

**Student 4.** Figure 26 shows the number of words response to “Tell me what you read” for Student 4 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text was analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 15.80, after PW was 20.40, and after IL was 18.00. The median for IR was 17.00, PW was 21.00, and RR-IL was 18.00.

*Figure 26. Retell: “Tell Me What You Read” by condition (Student 4).*
Visually, there is variance in the data and overlap between the conditions between sessions 5 and 10. The first three sessions show differentiation between the PW and IR method and the PW, and between the IR method and the RR-IL method. The data then show overlap between the conditions. The last five data points show PW and RR-IL differentiating from the IR method. The overall trend for IR is a decrease from session 1 through session 14; for RR-IL there is an initial increase and then decrease from sessions 7 through 15; and for PW there is a decrease from session 3 through session 13.

Student 5. Figure 27 shows the number of words response to “Tell me what you read” for Student 5 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text were analyzed by condition. The mean number of words response after IR was 24.20, after PW was 26.60, and after RR-IL was 21.20. The median for IR was 22.00, PW was 27.00, and RR-IL was 22.00.

Figure 27. Retell: “Tell Me What You Read” by condition (Student 5).
Visually, the data show overlap and a lack of differentiation between the IR, PW, and RR-IL conditions. The overall data appear to increase from sessions 6 through 10, and then decrease to at and below the initial five data points for the last few sessions.

**Student 6.** Figure 28 shows the number of words response to “Tell me what you read” for Student 6 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text were analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 20.00, after PW was 29.40, and after RR-IL was 23.80. The median for IR was 20.00, PW was 22.00, and RR-IL was 21.00. The mode for PW was 22.00.

Visually, the data show overlap and a lack of differentiation between the IR, PW, and IL conditions. The data show no increase in level and possible slight decrease between the first and last few data points. Some variance is noted at sessions 10 and 11.

![Figure 28. Retell: “Tell Me What You Read” by condition (Student 6).](image-url)
Student 7. Figure 29 shows the number of words response to “Tell me what you read” for Student 7 over the 15 sessions by condition. Unaided responses to “Tell me what you read” after reading the Harcourt text were analyzed by condition: IR, PW, RR-IL. The mean number of words response after IR was 28.00, after PW was 29.20, and after IL was 24.40. The median for IR was 27.00, PW was 29.00, and IL was 19.00. The mode for IR 37.00 and IL was 19.00.

Visually, the data show a lack of differentiation between the IR, RR-IL, and PW conditions between session 1 and session 7. The PW method differentiates slightly from the IR and RR-IL methods between session 8 and session 15. All of the lines show a decrease in trend from first data points through the final data points collected.

Figure 29. Retell: “Tell Me What You Read” by condition (Student 7).
Research Question 5

What are the differential effects between Incremental Rehearsal, Pocket Word, and repeated readings at the instructional level on the percentage of correct responses to five aided questions, “Who, What, When, Where?”

Aided Questions: Percentage Correct

Aided responding was assessed after the reading of each generalization passage and after the unaided responding was assessed. Aided responding was assessed by asking five questions beginning with “Who,” “What,” “When,” “Where,” or “How” and then accurate and inaccurate responses were recorded. The “Wh” questions were standardized per passage so each student was asked the same five questions for passage 1 through passage 15. The percentage of aided questions correctly answered is shown in Table 7.

Table 7

<table>
<thead>
<tr>
<th></th>
<th>Incremental Rehearsal</th>
<th>Pocket Word</th>
<th>Repeated Reading with Instructional Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>72</td>
<td>56</td>
<td>76</td>
</tr>
<tr>
<td>Student 2</td>
<td>68</td>
<td>72</td>
<td>64</td>
</tr>
<tr>
<td>Student 3</td>
<td>60</td>
<td>56</td>
<td>64</td>
</tr>
<tr>
<td>Student 4</td>
<td>68</td>
<td>52</td>
<td>60</td>
</tr>
<tr>
<td>Student 5</td>
<td>56</td>
<td>64</td>
<td>56</td>
</tr>
<tr>
<td>Student 6</td>
<td>88</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Student 7</td>
<td>88</td>
<td>84</td>
<td>76</td>
</tr>
</tbody>
</table>
For percentage of correct aided questions, the IR method had a mean of 71.43% \((M=71.43)\), PW had a mean of 67.43% \((M=67.43)\), and RR-IL had a mean of 69.14% \((M=69.14)\).

Of the aided percentage of questions correct, Students 4, 6, and 7 demonstrated the highest percentage of accuracy with IR. Students 2, 5, and 6 demonstrated the highest percentage of accuracy with PW, and Students 1, 2, 3, and 6 demonstrated the highest percentage of accuracy with RR-IL.

*Student 1.* Figure 30 displays the aided responding percentage of questions answered correctly by condition for Student 1. Student 1 demonstrated an average of 72% aided responding correct for the Incremental Rehearsal method, an average of 56% aided responding correct for the Pocket Word method, and 76% aided responding correct for the Instructional Level text. The median percentage of aided responding correct for Student 1 was 60% for the Incremental Rehearsal method, 60% for the Pocket Word method, and 80% for Repeated Reading in Instructional Level text. The mode percentage of aided responding correct for Student 1 was 60% for the Incremental Rehearsal method, 80% for the Pocket Word method, and 100% for the Repeated Reading in Instructional Level text.

Visually, the PW method appears to be less effective than either the IR or PW method. The RR-IL and IR methods show similar trends. The RR-IL method is the highest data point across 80% of points.

*Student 2.* Figure 31 displays the aided responding percentage of questions answered correctly by condition for Student 2. Student 2 demonstrated an average of 68%
aided responding correct for the Incremental Rehearsal method, an average of 72% aided responding correct for the Pocket Word method, and 72% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for Student 2 was 80% for the Incremental Rehearsal method, 80% for the Pocket Word method, and 80% for the Instructional Level text. The mode percentage of aided responding correct for Student 2 was 80% for the Incremental Rehearsal method, 80% for the Pocket Word method, and 80% for the Instructional Level text.

Visually, there appears to be overlap in data points for Student 2. There is overlap between PW and RR-IL in weeks 2 and 3, and overlap between IR and PW in weeks 4 and 5. RR-IL appears to be most effective in weeks 2, 3, and 4; the IR method appears to be most effective in week 1.

Figure 30. Aided questions percentage correct by condition (Student 1).
Student 3. Figure 32 displays the aided responding percentage of questions answered correctly by condition for Student 3. Student 3 demonstrated an average of 60% aided responding correct for the Incremental Rehearsal method, an average of 56% aided responding correct for the Pocket Word method, and 64% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for Student 3 was 60% for the Incremental Rehearsal method, 60% for the Pocket Word method, and 60% for the Repeated Reading in Instructional Level text. The mode percentage of aided responding correct for Student 3 was 40% for the Incremental Rehearsal method, 80% for the Pocket Word method, and 40% for the Repeated Reading in Instructional Level text.
Visually, there is overlap in the data. The IR method appears strongest in week 1; the PW method appears strongest in weeks 2 and 5, and the RR-IL method appears strongest in weeks 3 and 4.

**Student 4.** Figure 33 displays the aided responding percentage of questions answered correctly by condition: IR, PW, RR-IL for Student 4. Student 4 demonstrated an average of 68% aided responding correct for the Incremental Rehearsal method, an average of 52% aided responding correct for the Pocket Word method, and 60% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for student 4 was 60% for the Incremental Rehearsal method, 60% for the Pocket Word method, and 60% for the Repeated Reading in Instructional Level text. The mode percentage of aided responding correct for Student 4 was 40% for the Incremental Rehearsal method, 60% for the Pocket Word method, and
Figure 33. Aided questions percentage correct by condition (Student 4).

40% for the Repeated Reading in Instructional Level text.

Visually, all three methods appear equally effective at week 1, RR-IL and PW in week 2, RR-IL in week 3, and IR in weeks 4 and 5. The IR method shows an increasing trend with the last two data points at 100%.

Student 5. Figure 34 displays the aided responding percentage of questions answered correctly by condition: IR, PW, RR-IL for Student 5. Student 5 demonstrated an average of 56% aided responding correct for the Incremental Rehearsal method, an average of 64% aided responding correct for the Pocket Word method, and 56% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for Student 5 was 40% for the Incremental Rehearsal method, 60% for the Pocket Word method, and 60% for the Repeated Reading in Instructional Level text. The mode percentage of aided responding correct for Student
Figure 34. Aided questions percentage correct by condition (Student 5).

5 was 40% for the Incremental Rehearsal method, 60% for the Pocket Word method, and 80% for the Repeated Reading in Instructional Level text.

Visually, the IR and RR-IL methods are highest at week 1, PW at week 2, RR-IL at week 3, RR-IL and PW at week 4, and IR and PW at week 5. RR-IL has the more frequent highest data point with 60% highest data points. There is overlap between the data points.

Student 6. Figure 35 displays the aided responding percentage of questions answered correctly by condition: IR, PW, RR-IL for Student 6. Student 6 demonstrated an average of 88% aided responding correct for the Incremental Rehearsal method, an average of 88% aided responding correct for the Pocket Word method, and 88% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for Student 6 was 80% for the Incremental Rehearsal method, 100% for the Pocket Word method, and 100% for the Repeated
Figure 35. Aided questions percentage correct by condition (Student 6).

Reading in Instructional Level text. The mode percentage of aided responding correct for Student 6 was 80% for the Incremental Rehearsal method, 100% for the Pocket Word method, and 100% for the Repeated Reading in Instructional Level text.

Visually, PW has the highest data points for weeks 1, 2, and 3; IR has the highest data points in weeks 2 and 4, and RR-IL has the highest data points in weeks 1, 4, and 5. RR-IL has 60% of the highest data points. There are overlapping data.

Student 7. Figure 36 displays the aided responding percentage of questions answered correctly by condition: IR, PW, RR-IL for Student 7. Student 7 demonstrated an average of 88% aided responding correct for the Incremental Rehearsal method, an average of 84% aided responding correct for the Pocket Word method, and 76% aided responding correct for the Repeated Reading in Instructional Level text. The median percentage of aided responding correct for Student 7 was 100% for the Incremental
Figure 36. Aided questions percentage correct by condition (Student 7).

Rehearsal method, 80% for the Pocket Word method, and 80% for the Repeated Reading in Instructional Level text. The mode percentage of aided responding correct for Student 7 was 100% for the Incremental Rehearsal method, 100% for the Pocket Word method, and 80% for the Repeated Reading in Instructional Level text.

Visually, the PW method shows highest data points for week 1, week 2, week 3, and week 4; the IR method shows highest data points for weeks 1, 2, 4, and 5; and the RR-IL method is highest for week 3. The IR method demonstrated highest data point for 80% of the weeks. RR-IL appears to be the lowest overall with 60% data points lowest.

**Synthesis of Results**

The data presented in this chapter can be synthesized in regard to findings pertaining to word retention, generalization of new words in text, and retell. In regard to
the visual analysis of word retention by condition, the IR and PW methods clearly
differentiated from RR-IL. At 24 hours, Students 2 and 6 responded to IR, Student 5
responded to PW, and Students 1, 3, 4, and 7 responded to both IR and PW. At 7 days,
Students 2, 3, 5, and 6 responded to IR, while Students 1, 4, and 7 responded to both IR
and PW. As such, IR and PW led to more words being retained than RR-IL.

In regard to generalization in the Harcourt text, 80% of the students correctly read
81.80 to 100% of the previously unknown words correctly. One student read 50% of the
words in text correctly. Words read correctly in text were 72.40% for IR, 73.51% for RR-
IL, and 58.04% for PW. IR and RR-IL led to better generalization of words read correctly
in the Harcourt text.

The Friedman test confirmed IR and RR-IL led to greater generalization of words
read correctly in the Harcourt text as the Mean Rank for IR was 1.69, RR-IL was 1.81,
and PW was 2.50. In addition, a Post Hoc text using the Wilcoxon Signed Rank
confirmed IR showed statistical significance over PW at 112.5. A comparison of IR and
RR-IL was 47.5 with a significance of .502. A comparison of RR-IL and PW was 94.5
and the significance was .169. There was no significant difference between IR and RR-IL
or RR-IL and PW.

The data pertaining to retell and aided retell show no clear differentiation between
the methods when visually reviewed. In regard to unaided retell, Students 1, 4, 5, 6, and 7
demonstrated a higher mean number of words in response to the PW condition, while
Students 2 and 3 demonstrated a higher mean number of words in response to RR-IL.
In regard to aided retell, Students 4 and 7 showed higher accuracy with IR, Students 2 and 5 showed higher accuracy with PW, and Students 1 and 3 showed higher accuracy with RR-IL. Student 6 showed no differentiation between methods.
CHAPTER 5

DISCUSSION

This retrospective study used a multi-element design to compare the effect of the Incremental Rehearsal method, the Pocket Word method, and repeated reading within Instructional Level text on the word retention, words read per minute, and retell of seven first-grade students.

Summary and Comparison to Other Studies

The current study was different from previous studies comparing drill ratios and drill methods in that each student’s acquisition rate was assessed. Prior research with 7-year-old students has demonstrated an average capacity for new information of three new items at one time. Prior research (Burns, 2004c) found first-grade students to have acquisition rates to range from $M=2.94$ to $M=3.23$. The acquisition rate ($M=2.71$) ranged from two to four. Furthermore, 43% of students had an acquisition rate of three; 43% of students had an acquisition rate of two; and 14% had an acquisition rate of four. Although the mean approximated previous research data, the group showed variation in their rate of acquisition.

Previous research on the IR method did not include first-grade students as it was understood that the presentation of nine unknowns involved in the IR sequence would exceed the students’ capacity for new information. As such, the current study followed
the prescribed sequence for the IR method; however, the number of unknown words presented corresponded to the individual student’s acquisition rate. As such, students learned four, three, or two new words at one time depending on their acquisition rate. The students were also taught only the number of unknown words corresponding to their acquisition rate with the PW method.

The Pocket Word method (Gravois & Gickling, 2002b) has been suggested as an alternative to the Incremental Rehearsal method for teaching unknown words. The PW method involved students being introduced to each unknown word (pronounce, spell, define, use in sentence), responding to a staff or peer question “Show me your pocket words” by: (a) removing pocket words from his or her pocket, (b) reading each word one time.

Once the students’ acquisition rates were assessed, each student’s individual acquisition rate was then held constant across the IR and PW methods. The purpose for using and controlling the acquisition rate is both to respect the individual student’s capacity for new information and to ensure the sequence is stopped prior to student frustration and subsequent errors. When a student becomes frustrated and begins to make errors, interference can occur, and can negatively impact retention and/or cause inaccurate learning. Once inaccurate learning occurs, it is thought to take more time to correct than to learn correctly the first time through. The students participating in this study increased their known words from pre-assessment to post-assessment on the Dolch Word List by approximately 40% across the IR, PW, RR-IL conditions. Pre-administration and post-administration of the Dolch Word List for all conditions showed visual and statistical effects compared to baseline for word retention for all students
participating in the study. Visual data analysis of the three conditions, by individual student and by group cumulative data, shows a clear increase in all three conditions with differentiation between the IR and PW method and the RR-IL method across all seven students. Effect size was determined to be .69 using Cohen’s $d$. Student increase in word retention from baseline to post-intervention ranged from an increase of 45 to 72 and pre-test ($M=93.28$) and post-test ($M= 152.42$).

Both the IR method ($M=2.54$ 1-Day; 2.66 7-Day) and the PW method ($M=2.51$ 1-Day; $M=2.43$ 7-Day) were found to be effective methods in regard to retention of unknown words after 1 and 7 days. After 24 hours, 93% of words taught using the IR method were retained; 91% of words taught using the PW method were retained; and 79% of words taught using the RR-IL method were retained for all students. After 7 days, 98% of words taught using the IR method were retained, 89% of words taught using the PW method were retained, and 80% of words taught using the RR-IL method were retained. The student data obtained for the current study reflect the percentage of words retained, which has been noted in Burns and Sterling-Turner (2010), Joseph and Nist (2006), and MacQuarrie et al. (2002). A visual observation of note is at the 7-day retention check where the Incremental Rehearsal method led to increasing retention, while the Pocket Word method had decreasing retention for individual students.

While the IR method and the PW method led to larger gains in word retention, the RR-IL method appeared to lead to gains for all students in reading accuracy within the RR-IL condition itself. In essence, the repeated reading occurred at the instructional level, which meant that students knew more words and had a higher percentage of known words leading to higher words read per minute gains. In addition, the students increased
in their reading accuracy or known words in text ($M=96.25\%$) between the first read of the first passage and the final read ($M=98.9\%$) on the final passage. Overall reading accuracy within the RR-IL condition within text controlled to an instructional level was determined to be 96.7\% across all passages for all students. Students also showed growth with the RR-IL condition for words read per minute increasing from $M=58$ on the first read of the first passage to $M=85$ on the final read of the final passage. The RR-IL ($M=72.37$) words-per-minute for all students across all passages ranged from 42.53-106.00.

The IR, PW, and RR-IL methods appear to have impacted words read per minute in grade-expected generalized text (Harcourt). Visually, however, there is little to no differentiation between the conditions. Student 1 shows the start of a possible differentiation on the final data point with higher trend for the PW method; however, additional data collection would be necessary to determine whether the pattern continued. In addition, Student 6 started with a slight differentiation of higher response to the IR method and RR-IL method, which was not apparent in subsequent sessions. The lack of differentiation is not to say there was an absence of growth. Reading accuracy on the first reading passage in grade-expected generalized text across all students showed a median of 91\%, and accuracy on the 15$^{\text{th}}$ passage in grade-expected text showed a median of 95\%. In addition, 86\% of the students showed an increase in accuracy when the first seven data points were compared to the last seven data points. In the first half of the data points, there were 11 data points within the instructional level (93-97\%). On the second half of the data points, there were 19 data points within the instructional level and six
within the independent level (98-100%). As such, an observation of note is that the last half of the data was steeper than the first half of the data.

The mean reading accuracy for all students reading within the grade-expected generalized text was 90.22%, which was well within the frustrational level of 92% and below. Reading accuracy within the instructional level passages during the RR-IL condition was higher at 96.7%.

While not experimentally shown, previously unknown words taught using the IR, PW, and RR-IL methods were assessed for accuracy within the generalization to grade-expected text. The purpose of assessing previously unknown words in grade-expected text is to assess whether the method used to teach the unknown words leads to word retention and whether the word retention led to generalization of the known word in grade-expected materials. Visual analysis shows the majority of students were able to read correctly at least 80%, or more, of the previously unknown words when encountering the words while reading within grade-expected text. The seven students correctly read 85.25% of the previously unknown words correctly within the grade-expected text. Individual student accuracy was as follows: Student 1: 89.50%; Student 2: 81.80%; Student 3: 50%; Student 4: 90%; Student 5: 93.75%; Student 6: 100%; and Student 7: 91.67%. Eighty percent of the group read a minimum of 81.80% of words correctly in text with a range of 81.80-100% correct. When accuracy was analyzed in relation to condition, words read correctly for the IR method ($M=72.40$) was higher than the PW method ($M=58.04$). Words read correctly was highest for the RR-IL method ($M=73.51$).
It should be noted that on the initial data point, 86% of the students read below the 50 words per minute or the minimum reading rate necessary for comprehension (Burns et al., 2002), and on the final data point, 43% of the students read below the minimum rate necessary. Words-per-minute in grade-expected generalized text was also computed for all students across all 15 passages. Visually, some differentiation between conditions on the first data point was noted for Students 1, 2, 5, and 6. Students 1, 2, and 6 decreased or no longer demonstrated a differentiation on subsequent data points. Student 5 showed the most differentiation among the students. Visually, it appears that for Students 3, 5, and with two conditions, Student 6, the trend was upward. Students 1 and 4 remained consistent, and Student 2 showed a decreasing trend. In addition, an analysis of the end of the data shows RR-IL possibly beginning to differentiate across Students 1, 2, 3, 4, 6, and 7, while the PW method differentiates for Students 3 and 5. An option would have been to pursue the hypothesis that RR-IL was leading to increased WPM for what appears to be 87% of the students. The IR method appeared to be beginning to trend down at least for Students 4, 5, and 6, and additional data collection would have allowed for further confirmation of the trend. As such, no clear visual differentiation occurred.

The mean WPM for all students across all grade-expected generalized passages was 44.9 (M=44.9). The RR-IL method demonstrated the WPM (M=48.57) which most closely approximated the end-of-year goal of 53 WPM suggested by Hasbroucke and Tindal (2006). The PW method (M=44.71) and the IR method (M=41.43) were slightly lower. In addition, 71% of the students demonstrated an increase when the first seven
data points were compared to the second seven data points. The total increase from the first half to the second half was 8.86 for Student 3 and 6.43 for Student 5.

Within the RR-IL condition, where each passage was controlled to an instructional level of 93-97% known words for each student, words read per minute was higher ($M=72.37$) than in the grade-expected generalized text at a frustrational level ($M=44.9$). The group of students read 27.47 more within Instructional Level text. If we compare words read per minute within the grade-expected generalized text ($M=44.9$) to the first read within the RR-IL condition ($M=58.74$), the group read 13.84 words per minute more within Instructional Level text. For this group of students, the student’s number of words read per minute appears to have increased as a by-product of knowing 93-97% of the words in text. As such, the difference in their reading within the grade-expected generalized text and the RR-IL passages would appear to be their prior knowledge. When the students knew 93-97% of the words in text ($M=96.7%$), they were able to read more WPM. When the students had the word recognition and word meaning to automaticity within RR-IL, the students demonstrated that WPM was a by-product of known words to automaticity. When the students read grade-expected generalized text within the frustrational level ($M=90.22%$), their words read per minute was lower ($M=44.9$). As such, with this group of students, measuring words-per-minute without measuring reading accuracy to ensure an instructional level becomes a measurement of lack of prior knowledge or known words to automaticity. Given that, words read per minute could be more of a measure of prior knowledge than a measure of reading accuracy. Thus, in this study, to assess generalization of previously unknown words taught: (a) an increase in percentage of reading accuracy toward the instructional level of
93-97% known, and (b) the use of the percentage of previously unknown words read correctly in text may be a more precise measure of the students’ generalized learning than words read per minute.

After accuracy and words read per minute was assessed within the grade-expected generalized text, unaided retell was determined by recording the number of words the student stated in response to the prompt, “Tell me what you read” within 2 minutes. Prior to an analysis of the unaided retell, it should be noted that Students 1, 2, 3, 4, and likely 5 do not yet read at a minimum rate (50 WPM) for comprehension to occur (Burns et al., 2002).

Visually, it appears that overall there may be some differentiation in regard to at least one condition over a minimum of three data points for Students 1, 3, 4, and 7. Students 1, 3, and 7 appear to show increased response to the PW method, and the same pattern may be emerging for Student 5. Students 2 and 6 show no differentiation. The overall pattern seems to be consistent without increase across students. However, there is no clear overall differentiation.

Furthermore, in the unaided retell condition the condition with the highest number of cumulative word responses was the Pocket Word method for five of the seven students. The Instructional Level-Repeated Reading method was highest for two of the seven students, and the Incremental Rehearsal method had the highest cumulative retell for zero (0) of the seven students.

Once the unaided retell was complete, five aided or “Wh” questions were asked. Again, Students 1, 2, 3, 4, and possibly 5 are consistently reading less than 50 WPM, which is not yet at a rate necessary for comprehension. For percentage of correct aided
questions, the IR method had a mean of 71.43% ($M=71.43$), PW had a mean of 67.43% ($M=67.43$), and RR-IL had a mean of 69.14% ($M=69.14$). Students 4, 6, and 7 demonstrated the highest percentage of accuracy with IR; Students 2, 5, and 6 demonstrated the highest percentage of accuracy with PW; and Students 1, 2, 3, and 6 demonstrated the highest percentage of accuracy with RR-IL. Visually, there was no clear differentiation of a single method.

**Implications of the Study**

The results of this study appear to support the contention that interspersal of a high degree of known words with a small degree of unknown words is an effective method for teaching unknown words and retaining unknown words over time. Specifically, the study indicated that for this group of students, the Incremental Rehearsal method was superior at the 1-Day and 7-Day retention checks. In addition, this study appears to also support the contention that the use of 100% unknown words, per the Pocket Word method, is effective for teaching unknown words. Specifically, the study indicated for this group of students, the Pocket Word method was nearly equal to the Incremental Rehearsal method for retention of words at the 1-Day check. However, the study showed that the Incremental Rehearsal method was slightly more effective at the 7-Day retention check, as total retention for all students increased. The study showed that the Pocket Word method led to a decrease in the total number of words retained at the 7-Day retention check. For these students, the study indicates that both the Incremental Rehearsal method and the Pocket Word method are effective methods for teaching words and retention of words.
In addition, the study showed that for this group of students, the RR-IL condition was the least effective method for teaching unknown words in comparison to the IR and PW methods. While the RR-IL condition appears to be more effective than IR or PW in regard to words read per minute, the RR-IL condition contained fewer unknown words, and reading accuracy would be higher as a result. As previously discussed, as accuracy or percentage of known words appears to be a measure of prior knowledge, the higher performance was a result of higher known words in the passage. As such, PW and IR appear to be more effective than RR-IL in reducing the number of unknown words. It should be noted that PW was least effective for Student 3 at 7 days.

Furthermore, the study highlighted the disadvantage of using words read per minute as a measure of generalization of previously unknown words in grade-expected text due to the large number of unknown words encountered and the need to focus on accuracy. The study showed that for this group of students, a more effective measure of generalization of previously unknown words into text may have been the measure of percentage of previously unknown words in text and increase in the percentage of known words in text.

I believe that this study confirms the importance of controlling unknown words in text to 93-97% known for first-grade students. For students who are reading at 92% known or below, professionals can use either the IR or PW method as options to increase the student’s prior knowledge (i.e., words and word meanings) and ensure an instructional level of 93-97% known words prior to reading. Professionals can also create reading passages for students ensuring 93-97% known when encountering a high degree
of unknown words in text for any student who may need support in learning to read or to experience reading fluently in a passage with a high degree of known words.

I believe that this study also confirms data from prior studies in regard to the use of the individual student’s acquisition rate when presenting new information, that is, unknown words. It is clear that the maximum number of words that could be introduced at one time ranged from two to four for this group of first-grade students. The introduction of five, seven, or nine unknowns would have exceeded the acquisition rate for these students. Professionals can use acquisition rates when pre-teaching with the IR or PW method to keep errors low, minimize the risk of interference, and maximize pre-teaching time.

**Theoretical Implications**

The current study selected the lowest scoring students in the first grade based on pre-test scores using the three-trial method. As such, the participants in this study might each be considered at-risk learners. According to Kame’enui, Carnine, Dixon, Simmons, and Coyne (2002), at-risk learners need instructional strategies which support retaining information, strategy knowledge and use, vocabulary knowledge, and language coding. It could be argued that this study addressed the first three. At-risk learners also might tend to be functioning at an initial acquisition level in which they are obtaining and mastering basic skills and have not yet become automatic enough in basic skills (i.e., known words) to have developed sufficient fluency or comprehension. Thus, theoretical implications would involve:

1. An understanding is needed that children working on the acquisition of basic skills may not yet have the automaticity in word recognition and meaning to generalize
into grade expected text at the frustrational level or have a sufficient word recognition and meaning base to yet display comprehension.

2. Longer time sampling may be needed for students at the acquisition phase.

3. Students at an acquisition phase may not receive a valid assessment of true fluency when measured by words per minute using 3 second, 4 second, or 5 second wait times, as six errors could take 30 seconds.

4. Students at an acquisition phase may be assessed with more validity and reliability by a generalization measure such as words read correctly in text.

Suggestions for Further Research

This study revealed interesting findings as previously stated. It is hoped that this study will be replicated to verify these findings. In addition, it is hoped that this study can be replicated with different populations in different settings. Specifically, I hope that the following questions will be pursued:

Theory

1. To what extent do students at the acquisition phase provide themselves with repetitions in between each showing of their pocket words?

2. To what extent do spacing effects impact the effectiveness of the Pocket Word method?

3. To what extent does peer-mediated learning or social learning mitigate repetition requirements when using the pocket words?

4. To what extent might the public performance variable of pocket words lead to higher retention?
5. To what extent does the Incremental Rehearsal method increase student retention over time, that is, continue to increase at 7 days, 14 days, 30 days, etc.?

Practice

1. Would the same extent of change in words per minute, unaided retell, or aided comprehension occur when unknown words are taken from grade-expected text instead of a word list?

2. Would the same extent of change in words per minute, retell, and aided comprehension occur when unknown words are taken from grade-expected text and the interventions are used to teach unknown words in text?

3. Would similar results occur if the number of data points was doubled or if the study continued with each student’s two most effective conditions for an additional set of data points?

4. Would similar results occur if the study was replicated and retention was checked at 30, 60, or 90 days?

Recommendations

Theory

1. Researchers within the field may wish to further examine the current procedures for determining fluency (Deno, 1985) and the methods used within CBA-ID (Coulter & Coulter, 1990), that is, waiting 2, 3, 4-5 seconds for an unknown word as opposed to immediately providing a word once it is recognized that a student doesn’t know the word (Tucker, 1989b). One way to do this might be to measure words read correctly within text.
2. Researchers within the field may also wish to further explore the Incremental Rehearsal method to determine the underlying mechanisms for its effectiveness, that is, further exploration of the spacing effect (Dempster, 1988).

3. Researchers within the field may also wish to further explore the Pocket Word method to determine the underlying mechanism for its effectiveness, that is, social learning, public performance, or whether students may provide their own internal dialogue of rehearsal between showing their pocket words to another person.

Practice

1. School psychologists (interventionists, Title 1 teachers, graduate students, and literacy consultants), and their students in need of support in learning to read, would benefit from training in single-case design.

2. School psychologists, and others mentioned above, would benefit from using single-case design research to determine the most effective instruction for the individual student and replicate it with a number of students.

3. School psychologists using single-case design research to inform practice will be able to continue to realign their role to improving instructional outcomes for children.

4. School psychologists would benefit from receiving systematic training in CBA-ID, instructional methodologies like IR, PW, and RR-IL.

5. School psychologists who have mastery of many instructional methodologies can use single-case design research to determine the most effective instruction for the individual student.

6. Intermediate School Districts and district administration may wish to incorporate CBA-ID, IR, PW, and RR-IL into their training schedule on a regular basis to
ensure students in kindergarten, first, and second grade are able to master letter sounds, develop word recognition and meaning to automaticity, as well as to ensure that teachers and interventionists have tools with which to create and maintain an instructional level and create success for our students—whichever type of instruction they may need.

7. School Psychology and Teacher Education programs may wish to ensure that future professionals are trained to mastery in the areas of single-case research design, curriculum-based assessment for instructional design (CBA-ID), and implementation of effective interventions.

**Concluding Statement**

The idea of the Matthew Effect (Hargis, 1982; Stanovich, 1986) described as “the rich get richer and the poor get poorer” is alive and well in education. Recent research has suggested a negative effect size for special education services (Kavale & Forness, 1999; Hattie, 2009). The IR and PW methods appear to be powerful tools to ensure retention for word recognition and meaning and, subsequently, appear to link to fluency and comprehension. The RR-IL method appears to be a powerful tool for increasing reading fluency. Instructional methods like those within this study, and the methodology of single-case research itself, can be used in our efforts to prevent curriculum casualties (Hargis, 1982), reduce achievement gaps, and reverse the Matthew Effect (Stanovich, 1986).
APPENDIX A

CONDITION 1: INCREMENTAL REHEARSAL METHOD
**CONDITION 1: INCREMENTAL REHEARSAL METHOD**

Using a flashcard rehearsal technique the teacher folds in unknown vocabulary words in the following prescribed manner. The new and known (9) vocabulary words were taken from the district’s Dolch Word List.

<table>
<thead>
<tr>
<th>Flashcard ratio</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. THE NEW WORD (N1)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>2. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>3. THE NEW WORD (N1)</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>4. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>5. A known word (K2)</td>
<td></td>
</tr>
<tr>
<td>6. THE NEW WORD (N1)</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>7. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>8. A known word (K2)</td>
<td></td>
</tr>
<tr>
<td>9. A known word (K3)</td>
<td></td>
</tr>
<tr>
<td>10. THE NEW WORD (N1)</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>11. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>12. A known word (K2)</td>
<td></td>
</tr>
<tr>
<td>13. A known word (K3)</td>
<td></td>
</tr>
<tr>
<td>14. A known word (K4)</td>
<td></td>
</tr>
<tr>
<td>15. THE NEW WORD (N1)</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>16. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>17. A known word (K2)</td>
<td></td>
</tr>
<tr>
<td>18. A known word (K3)</td>
<td></td>
</tr>
<tr>
<td>19. A known word (K4)</td>
<td></td>
</tr>
<tr>
<td>20. A known word (K5)</td>
<td></td>
</tr>
<tr>
<td>21. THE NEW WORD (N1)</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; Presentation</td>
</tr>
<tr>
<td>22. A known word (K1)</td>
<td></td>
</tr>
<tr>
<td>23. A known word (K2)</td>
<td></td>
</tr>
<tr>
<td>24. A known word (K3)</td>
<td></td>
</tr>
<tr>
<td>25. A known word (K4)</td>
<td></td>
</tr>
<tr>
<td>26. A known word (K5)</td>
<td></td>
</tr>
<tr>
<td>27. A known word (K6)</td>
<td></td>
</tr>
</tbody>
</table>
28. THE NEW WORD (N1) 7th Presentation  
29. A known word (K1)  
30. A known word (K2)  
31. A known word (K3)  
32. A known word (K4)  
33. A known word (K5)  
34. A known word (K6)  
35. A known word (K7)  

36. THE NEW WORD (N1) 8th Presentation  
37. A known word (K1)  
38. A known word (K2)  
39. A known word (K3)  
40. A known word (K4)  
41. A known word (K5)  
42. A known word (K6)  
43. A known word (K7)  
44. A known word (K8)  

45. THE NEW WORD (N1) 9th Presentation  
46. A known word (K1)  
47. A known word (K2)  
48. A known word (K3)  
49. A known word (K4)  
50. A known word (K5)  
51. A known word (K6)  
52. A known word (K7)  
53. A known word (K8)  
54. A known word (K9)  

The NEW WORD (N1) becomes the first known word (K1) and the process repeats with the next NEW WORD until the acquisition rate for the individual student is reached. If the student’s acquisition rate is 3, then only 3 new words are taught.
APPENDIX B

CONDITION 2: POCKET WORD METHOD
CONDITION 2: POCKET WORD METHOD

Each student’s unknown words were placed onto ¼ 3X5 index card, one word per card. The Pocket words were shown to 9 individuals outside the students’ classroom using the prompt, “Show me your pocket words.” The number of Pocket Words for each student equaled the individual student’s acquisition rate.
APPENDIX C

CONDITION 3: INSTRUCTIONAL LEVEL TEXT
CONDITION 3: INSTRUCTIONAL LEVEL TEXT

Fifty word passages were written and adapted to an instructional level of 93-96% known words for each student, i.e. 2 unknown words in a 50 word passage. Words marked correct on the pre-test were considered to be “known words” while words marked incorrect on the pre-test were considered to be “unknown words.” The student read the 50 word passage three times.
REFERENCE LIST
REFERENCE LIST


VITA
VITA for Lara Lynne MacQuarrie

EDUCATION

1992. .......... B.A. English Literature, Creative Writing, Western Michigan University
1996. .......... M.A. Developmental and Educational Psychology, Andrews University

POSITIONS HELD

1998-2001 . . . . . . . . . . . . School Psychologist, Lincoln Consolidated Schools, Ypsilanti, MI
1999-2003 . . . . . . . . . . . . Instructor, Eastern Michigan University, Ypsilanti, MI
2001-2003 . . . . . . . . . . . . School Psychologist, Ann Arbor Public Schools, Ann Arbor, MI
2003-2006 . . . . . . . . . . . . School Psychologist, Whitmore Lake Schools, Whitmore Lake, MI
2006-Present . . . . . . . . . . . . Consultant, Oakland Intermediate School District, Waterford, MI

PUBLICATIONS


FIELDS OF STUDY

Major Field: Leadership, Educational Psychology

Areas of Interest: School Psychology, Curriculum-Based Assessment, Rate of Acquisition, Rate of Retention, and Reading Interventions