The Effect of Phoneme Awareness Instruction on Students in Small Group and Whole Class Settings

Angelique Fleurette Van Boden
Syracuse University

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Abstract

Phoneme awareness instruction plays a crucial role in reading acquisition for young children. While this early literacy topic has been studied for over 30 years, and cited by the National Reading Panel Report (2000) as an important area for further research, no reports to date explore the influence of instructional group size on phoneme awareness learning outcomes in children. Therefore, the purpose of the present study was to determine the impact of Small Group Instruction (SGI) compared to Whole Class Instruction (WCI) on phoneme awareness outcomes from phoneme awareness with letter sound instruction provided to 66 kindergarten children from a low-income, urban district in upstate New York. ANOVA and ANCOVA results from this pretest posttest quasi-experimental study revealed significant learning across 10-weeks for both group sizes. However, no significant advantage was evident for SGI over WCI in phoneme awareness, letter knowledge, reading, or spelling. The implications of these findings are discussed in the context of providing whole class phoneme awareness instruction as an alternative to traditional small group or one-to-one phoneme awareness instruction.
THE EFFECT OF PHONEME AWARENESS INSTRUCTION ON STUDENTS IN SMALL GROUP AND WHOLE CLASS SETTINGS

By

Angelique Fleurette VanBoden

B.S., LeMoyne College, 1995
M.S., SUNY at Cortland College, 1998

DISSERTATION

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Chapter 1

Introduction

An alarming ninety-three million adults cannot read at the basic literacy level (Kutner et al., 2007). Additionally, thirty million adults are unable to read common literature such as local newspapers, federal documents, or employment forms. However, these low levels of literacy develop before adulthood. Adults who cannot read well typically began as children who could not read well. For example, according to the 2007 National Assessment of Educational Progress (NAEP), the majority of current fourth graders (69%) and eighth graders (70%) read below the proficient level (Lee, Grigg, & Donahue, 2007) and children who are not successful readers are much less likely to become successful readers even with extensive remediation (Francis, Shaywitz, Steubing, Shaywitz, & Fletcher, 1996; Wren, 2002). With this in mind, it is better to prevent reading problems rather than attempt to remediate them when it may be too late (Torgesen, 2005).

Phoneme Awareness is Crucial to Reading Development

A strong, stable foundation for literacy acquisition is needed for the development of reading mastery (Fletcher, Lyon, Fuchs, & Barnes, 2007) and phonological awareness helps form this foundation. Phonological awareness is the awareness that language can be manipulated independently from its meaning (for example, the words “cat” and “hat” are similar because the words themselves rhyme, not because cats and hats are similar objects). This awareness includes language units as large as words and syllables, as well as the smallest units of sound -- phonemes. Phoneme awareness, a component of
phonological awareness, is the understanding that words are comprised of these individual sounds (Liberman & Shankweiler, 1985; Schuele & Boudreau, 2008; Yopp, 1992). Phoneme awareness consists of abilities such as counting the number of phonemes in words, distinguishing between and producing words that begin or end the same, segmenting and deleting phonemes in words, and blending phonemes into words.

Research has shown that children who lack phoneme awareness at the end of kindergarten or first grade are less likely to become successful readers by the end of third grade or even later (Foster, 2004; Foster & Miller, 2007; Juel, 1988; Share, Jorm, Maclean, & Matthews, 1984; Snow, Burns, & Griffin, 1998). Specifically, without competence in this foundational skill, it is harder to make connections between spoken words and the alphabetic system (Ryder, Tunmer, & Greaney, 2008). That is, if you don’t understand that the word “sat” is comprised of three sounds, it will be difficult to understand why “sat” should be written with three letters (Blachman, 1997). Instruction in phoneme awareness helps children make sense of those crucial associations. When phonemes are connected to their appropriate letters, children can begin to decode (or “sound out”) words. Thus, phoneme awareness helps children understand the logic of an alphabetic writing system (Snow et al., 1998) and is especially important for early reading development (Blachman, 2000; Ehri & Wilce, 1979; Fox & Routh, 1975; Liberman, 1973; Liberman, Shankweiler, Fischer, & Carter, 1974; Lundberg, 1991; Puolakanaho et al., 2008; Rosner & Simon, 1971). Although phoneme awareness is necessary, it is not sufficient for successful reading development by itself (Byrne & Fielding-Barnsley, 1989; Ehri, Nunes, Stahl, & Willows, 2001; Hatcher, Hulme, & Ellis, 1994; Tunmer, Herriman, & Nesdale, 1988).
Research has shown repeatedly that this necessary aspect of reading acquisition can be increased with instruction and that instruction leads to improved outcomes in phoneme awareness, reading, and spelling (Ball & Blachman, 1991; Blachman, Ball, Black, & Tangel, 1994; Bradley & Bryant, 1983, 1985; Byrne & Fielding-Barnsley, 1993; Ehri & Roberts, 2006; Hecht & Close, 2002; Lundberg, Frost, & Peterson, 1988; Olofsson & Lundberg, 1983; Phillips & Torgesen, 2006; Williams, 1980). Phoneme awareness instruction can also be effective in increasing the reading achievement of special populations of children, such as those with Down syndrome (Goetz, et al., 2008; Jarrold, Thorn, & Stephens, 2009). Despite widespread empirical support for increasing a child’s phoneme awareness, questions remain regarding the optimal grouping strategies for providing phoneme awareness instruction in the classroom.

**Group Size Research**

There are no published empirical research studies to date that directly investigate the differences in outcomes of students receiving phoneme awareness instruction in small groups compared to students receiving similar phoneme awareness instruction in whole classes (National Reading Panel, 2000). However, there is a handful of related research on the impact of group size on early reading outcomes. Studies comparing the outcomes of students receiving reading instruction in either individual (one-to-one) tutoring sessions or small groups resulted in reading outcomes that did not show a statistically significant benefit for one-to-one instruction (Iversen, Tunmer, & Chapman, 2005; Vadasy & Sanders, 2008; Vaughn et al., 2003).

Specifically, in the study by Vaughn and colleagues, second-grade struggling readers performed similarly regardless of whether they received one-to-one instruction or
instruction in a group of three. These outcomes were also compared to students who received instruction in a large group of 10. Although the students who received instruction in groups of 10 made gains, the gains were not as large as those made by the students receiving one-to-one or small group instruction. In a now classic study of one-to-one tutoring, Vellutino et al. (1996) raised reading outcomes in first graders (see Vellutino et al., 1996). In a replication study modifying the original tutoring lessons used by Vellutino and colleagues, Lennon and Selesinski (1999) instructed children in pairs. The replication study resulted in outcomes that were equivalent to those in the original lessons (Lennon & Slesinski, 1999). Additionally, a study looking at the effects of Reading Recovery lessons modified the original one-to-one tutoring lessons and likewise instructed children in pairs (Iversen et al., 2005). These lessons, too, resulted in equivalent outcomes on measures of reading for the children instructed in pairs.

Although these studies did demonstrate comparable results for one-to-one tutoring and small group instruction, there have not been any direct comparisons of small group and whole class instruction with respect to phoneme awareness, a comparison that the National Reading Panel (NRP) suggested is needed (National Reading Panel [NRP], 2000). In a study that involved increasing the group size of Reading Recovery lessons, Iversen and colleagues (2005) found that it may be necessary to increase the duration of each lesson by approximately 25% when modifying lessons to suit a larger group to increase opportunities for interaction and additional practice.

Increasing the number of students receiving the same instruction in a group has potential benefits for teachers. Specifically, providing instruction to a whole classroom of students at one time may save resources such as personnel and instructional time, while
still effectively delivering specific systematic instruction to children. When a teacher is providing instruction to a small group of students, the other students in the classroom are left to complete activities independently. Teachers often feel teaching the whole class at one time, in a large group, is a better way to maintain control of their classroom and to capitalize on their planning time and resources (Vaughn & Linan-Thompson, 2003). By providing all children with the necessary instruction at the same time, the teacher is able to keep all children actively engaged and supervised, as well as saving valuable teaching time. For example, instead of instructing 4 groups of 5 children for 30 minutes each, all children might receive the instruction in 45 minutes, freeing up one hour and 15 minutes of additional instructional time. However, as stated earlier, there are no published studies to date empirically comparing whole class to small group instruction in phoneme awareness.

The Role of the Teacher

The National Reading Panel Report (2000) stressed the importance of including instruction in phoneme awareness as one of five essential components of reading instruction. A decade after the National Reading Panel Report was published, teachers continue to grapple with ways to effectively include instruction in these five essential components of reading (phonemic awareness, phonics, fluency, vocabulary, and comprehension) in their classrooms (Barclay, 2009). Even though phoneme awareness instruction is important, many teachers find it difficult to implement (McGee & Ukrainetz, 2009). Researchers, too, are seeking options through which teachers might be more able to incorporate these components into different parts of the school day, such as
during read-alouds (Barclay, 2009) or by having other practitioners, such as speech and language pathologists, provide the instruction (Schuele & Boudreau, 2008).

Teachers face many challenges in the classroom, including optimizing instructional time and resources. Classrooms with additional personnel, such as special education teachers or teaching assistants, may find it easier to integrate small group instruction into the classroom (O’Connor, Notari-Syverson, & Vadasy, 1996). Conversely, without full-time assistants or additional personnel in the classroom, it is often difficult for kindergarten teachers to provide the small group, research-based, phoneme awareness instruction recommended. In many cases, because small groups are considered less practical by some teachers, phoneme awareness is simply not taught to the children who need it in kindergarten.

Given the established importance of phoneme awareness for kindergarten children, it is particularly important to explore the effectiveness of different instructional groupings -- especially if having a variety of options (for example, whole class formats and small group formats) might encourage more teachers to provide this needed instruction. If it is difficult or time consuming for teachers to provide phoneme awareness instruction to students in small groups, then the option of providing instruction to the whole class might be viable. However, if phoneme awareness instruction is only effective in small groups and one-to-one formats, it will be important to disseminate this information and explore how this instruction can be more easily transferred to classroom practice. The purpose of this study was to compare the effectiveness of phoneme awareness instruction provided in small groups to phoneme awareness instruction provided in whole classes.
Statement of Problem

There is a clear consensus in the research literature that phoneme awareness is crucial to reading acquisition and that it can be effectively taught to children in a variety of settings. However, whether small group phoneme awareness instruction has an advantage over whole class instruction remains unclear. The purpose of the present study was to investigate the training effects of phoneme awareness instruction on kindergarten children’s phoneme awareness, reading, and spelling progress when children were instructed in either small groups or whole class settings. If whole class instruction was found to produce similar outcomes to, for example, small group instruction, there is the possibility that teachers might be able to save instructional time and provide phoneme awareness instruction to more children.

Technical Definitions and Notes

Unless otherwise noted, all definitions have been taken from the glossary of Speech to Print (Moats, 2000).

1. **Onset.** The part of a syllable before the vowel; some syllables do not have onsets (p. 233).

2. **Phone.** A phonetic realization of a phoneme; the speech sound that is actually produced in spoken words (p. 233).

3. **Phoneme.** A speech sound that combines with others in a language system to make words (p. 233).

4. **Phoneme awareness.** The conscious awareness that words are made up of segments of our own speech that are represented with letters in an alphabetic orthography; also called phonemic awareness (p. 234).
5. **Phonological awareness.** Metalinguistic awareness of all levels of the speech sound system, including word boundaries, stress patterns, syllables, onset-rime units, and phonemes; a more encompassing term than *phoneme awareness* (p. 234).

6. **Pseudoword / nonword.** A word that could exist in a language in that all of its sounds and combinations are permitted, but it has no meaning whatsoever (Gregory, 2011, “What is a Pseudoword?,” para. 1).

7. **Rime.** A linguistic term for the part of a syllable that includes the vowel and what follows it; different from the language play activity of *rhyming* (Moats, 2000, p. 235).

It should also be noted that throughout this dissertation, letter sounds are set off by / /. For ease of reading, phonic symbols using conventional letters are used instead of phonetic symbols.
Chapter 2

Literature Review

The literature review begins with a general description of phonological awareness and then discusses phoneme awareness in the context of phonological awareness. This is followed by an historical account of the extensive literature on phoneme awareness and the different contexts in which it can be provided (one-to-one, small group, and whole class). The chapter concludes with a description of the purpose of this study and the research questions to be addressed.

Phonological Awareness

Research indicates that in order for word reading to develop, three main variables are necessary: phonological awareness, orthographic knowledge, and morphological awareness (Roman, Kirby, Parrila, Wade-Woolley, & Deacon, 2009). Although all three are intertwined, for the purpose of this study, the focus will be on phonological awareness, and more specifically, the component of phonological awareness known as phoneme awareness. Phonological awareness falls under the larger heading of metalinguistic ability (Tunmer et al., 1988), which requires a shift in attention from the subject matter (or meaning) of the word to the properties of the word (usage, syllables, phonemes) and the ability to manipulate those parts (Blachman, 2000; Castles, Coltheart, Wilson, Valpied, & Wedgwood, 2009; Ehri, Nunes, Stahl, & Willows, 2001; Ehri, Nunes, Willows, et al., 2001; Griffith & Olson, 1992; Jarrold, Thorn, & Stephens, 2009; Olson & Griffith, 1993; Pufpaff, 2009; Schuele & Boudreau, 2008; Smith, Simmons, & Kame’enui, 1998; Stanovich, 1993; Tunmer, et al., 1988). This awareness includes the
understanding that language can be broken up into different units such as sentences, words, syllables, onset and rime, and phonemes (Chard & Dickson, 1999; Phillips, Clancy-Menchetti, & Lonigan, 2008; Pufpaff, 2009).

Phonological awareness is one of the cognitive processes that best predicts early reading acquisition (Bowey, 2005; Hulme et al., 2002; Muter, Hulme, Snowling, & Stevenson, 2004; NRP, 2000; Snow et al., 1998; Stanovich, 1993). This awareness and manipulation of larger units as well as smaller units are linked to reading development (Pufpaff, 2009; Puolakanaho et al., 2008) and continue to play an important role in children reading pseudowords or nonwords through the eighth grade (Roman et al., 2009).

Phoneme Awareness in the Context of Phonological Awareness

The terms phonological awareness and phoneme awareness are often erroneously interchanged (Cheesman, McQuire, Shankweiler, & Coyne, 2009; Scarborough & Brady, 2002; Sensenbaugh, 1996). However, phoneme awareness is a sophisticated aspect of the broader concept of phonological awareness (Snow et al., 1998; Yeh & Connell, 2008) and involves the understanding and manipulation of the smallest unit of a spoken word: a phoneme (for example, the /c/ sound in the word “cat”). The report, How to Prevent Reading Difficulties in Young Children states, “The term phonological awareness refers to a general appreciation of the sounds of speech as distinct from their meaning. When that insight includes an understanding that words can be divided into a sequence of phonemes, this finer-grained sensitivity is termed phoneme awareness” (Snow et al., 1998, p. 51).
**Phonological awareness continuum.** Phoneme awareness is the most advanced form of phonological awareness according to the phonological awareness continuum described by Phillips et al. (2008) (see Figure 1). The components that comprise phonological awareness can be considered along a continuum from easiest to more difficult (Liberman et al., 1974; Puolakanaho et al., 2008; Schuele & Boudreau, 2008). At the beginning of the progression, children gain awareness of larger spoken units before they gain awareness of smaller spoken units (Carroll, Snowling, Hulme, & Stevenson, 2003; Fox & Routh, 1975; Goswami, 2000; Pufpaff, 2009), revealing that larger spoken units such as whole words or syllables are easier to manipulate than smaller units such as phonemes (Carroll et al., 2003; Liberman et al., 1974). This awareness and manipulation of larger units generally occurs at younger ages than awareness and manipulation of smaller units (Hulme et al., 2002; Muter et al., 2004; Puolakanaho et al., 2008).
In an effort to clarify the development of phonological awareness components, researchers have attempted to organize phonological awareness skills. Some organizational strategies were based on the phonological processing abilities necessary for specific tasks and others are based on the linguistic complexity involved in a task (Cassady, Smith, & Putman, 2008). As shown in Figure 1, the Phillips et al. (2008) continuum is comprised of phonological processing abilities progressing from less...
complex to more complex and includes word awareness, syllable awareness, onset-rime 
(the onset is the part of a word that comes before the vowel, such as the /tr/ in “trip”, and 
the rime is the vowel plus any consonants that come after it, such as the /ip/ in “trip”), 
and phoneme awareness.

**Phoneme awareness continuum.** As with phonological awareness, aspects of 
phoneme awareness also appear to develop along a continuum (Beck & Juel, 1995; Byrne 
& Fielding-Barnsley, 1989; Griffith & Olson, 1992; Pufpaff, 2009; Snow et al., 1998; 
Yopp & Yopp, 2000). The progression of phoneme awareness skills follows the same 
pattern as other phonological awareness skills: from simple to more complex. First, the 
child becomes aware of distinct spoken units, specifically, the phonemes. Once the 
phonemes are detected, the child develops the ability to manipulate those spoken units in 
various ways (including, for example, deleting phonemes or changing one phoneme to a 
different phoneme).

The ability to detect phonemes generally precedes the ability to manipulate 
phonemes. Specifically, phoneme manipulation (for example, a child is asked to say a 
word such as “mat,” and then asked to say it again without the /m/ sound) generally 
precedes or develops at the same time as learning the alphabetic principle. The alphabetic 
principle is the ability to connect phonemes to their corresponding letter (understanding 
that the /m/ sound in “mat” is made by the letter “m”) and it is distinct from phoneme 
awareness (Beck & Juel, 1995; Byrne & Fielding-Barnsley, 1989; Drouin & Harmon, 
2009; Yopp & Yopp, 2000).

It is important to note that phoneme awareness is also often confused with 
phonics (Phillip et al., 2008). They are not the same. When phoneme awareness is
combined with the alphabetic principle, it becomes phonics. Phonics is “the understanding that letters of the alphabet and the phonemes to which they correspond can be used to read words” (Harn, Stoolmiller, & Chard, 2009, p. 143).

Similar to many other cognitive skills, such as vocabulary development (Coyne, McCoach, Loftus, Zipoli, & Kapp, 2009), phoneme awareness develops incrementally – there are various degrees of partial knowledge, and complete mastery is not necessary before development of the next level begins (Coyne et al., 2009; Phillips et al., 2008; Pufpaff, 2009). This development is also dependent on the placement of each individual phoneme within a word or syllable. Stanovich, Cunningham and Cramer (1984) determined that it is easiest to detect and manipulate a phoneme when it is in the beginning of a word, rather than when it is at the end of a word. Awareness of ending sounds occurs after awareness of beginning sounds (Hulme et al., 2002; Muter et al., 2004; Stanovich et al., 1984). It is most difficult to detect and manipulate a phoneme that is in the middle of a word (Cassady et al., 2008), due to coarticulation (Liberman, 1971; Moats, 1999; Scarborough & Brady, 2002). Coarticulation occurs automatically when we pronounce words containing more than one phoneme, causing the phonemes to meld together with their adjacent phonemes, creating impure phonemes (for example, the /c/sound in “cat” is attached to the /a/ sound next to it, but the /a/ sound in “cat” is attached to both the /c/sound before it and the /t/ sound after it). Therefore, coarticulation makes it difficult for a phoneme to be pronounced separately from the other phonemes in a word (Adams, 1990).
The Importance of Phoneme Awareness

As has been established, phoneme awareness is important to reading acquisition (Bowey, 2005). However, some aspects of phoneme awareness seem to be more important and transfer to beginning reading better than others (NRP, 2000). Phoneme segmentation and phoneme blending ability are powerful predictors of beginning reading ability (Ball & Blachman, 1991; Bowey, 2005; Muter, Hulme, Snowling, & Taylor, 1998; NRP, 2000; Snow et al., 1998). According to research, phoneme segmentation skill is a better predictor of reading acquisition than rhyming skill (Hatcher & Hulme, 1999; Hatcher, Hulme, & Snowling, 2004; Hulme, 2002; Hulme et al., 2002; Hulme, Muter & Snowling, 1998; Muter et al., 2004; Muter, Hulme, Snowling & Taylor, 1998; Vervaeke, McNamara, & Scissons, 2007) even in children as young as four years old (Yeh & Connell, 2008).

The fact that phoneme awareness instruction is beneficial to reading acquisition is confirmed by national reports on reading such as The National Reading Panel Report (NRP, 2000), Beginning to Read: Thinking and Learning about Print (Adams, 1990), Preventing Reading Difficulties in Young Children (Snow et al., 1998), and the recent Report of the National Early Literacy Panel (National Early Literacy Panel, 2008). While the research is clear that phoneme awareness instruction needs to be a part of a balanced approach to reading, phoneme awareness instruction is crucial but it is not in itself the key to reading acquisition (Byrne & Fielding-Barnsley, 1989; Hatcher, Hulme, & Ellis, 1994; Podhajski, Mather, Nathan, & Sammons, 2009; Snow et al., 1998; Tunmer et al., 1988; Vandervelden & Siegel, 1997). Phoneme awareness instruction combined with
reading and writing instruction produces better progress in reading than phoneme awareness instruction alone (Castles et al., 2009; Hatcher et al., 1994; NRP, 2000).

**History of Phoneme Awareness Research**

Research on the relationship between phoneme awareness and reading development has been conducted for over 40 years. The role that phonological awareness plays in reading acquisition was initially investigated by Chall, Roswell, and Blumenthal (1963), Bruce (1964), and Liberman, Shankweiler, Fischer, and Carter (1974). Early and current correlational studies (see, for example, Fox & Routh, 1980; Liberman & Shankweiler, 1985; McCandliss, Beck, Sandak, & Perfetti, 2003; NRP, 2000; Perfetti, Beck, Bell, & Hughes, 1987; Phillips & Torgesen, 2006; Rosner & Simon, 1971; Snider, 1997) demonstrated a strong relationship between reading achievement and phoneme awareness. Numerous predictive studies indicate that performance on prereading phoneme awareness tasks is highly predictive of success in reading acquisition in first grade and beyond (Bradley & Bryant, 1983; Hulme et al., 2002; Lundberg, Olofsson, & Wall, 1980; Muter et al., 2004; Podhajski et al., 2009; Rupley, Blair, & Nichols, 2009; Scarborough, 1998; Share et al., 1984; Snider, 1997; Snow, et al., 1998; Stanovich et al., 1984; Vervaeke et al., 2007). Finally, decades of intervention studies demonstrate that direct instruction in phoneme awareness has a positive influence on initial decoding skill (Ball & Blachman, 1991; Blachman, Ball, Black, & Tangel, 1994; Blachman, Schatschneider, Fletcher, & Clonan, 2003; Bradley & Bryant, 1983, 1985; Bus, 1986; Byrne & Fielding-Barnsley, 1993; Lundberg et al., 1988; NRP, 2000; Olofsson & Lundberg, 1983; Vadasy & Sanders, 2008; Vervaeke et al., 2007; Williams, 1980).

Throughout this history, many of the intervention studies involved individual children or
children in small groups, while a limited number of studies focused on whole class instruction.

**Phoneme awareness is predictive of reading achievement.** Research has long supported the relationship between phoneme awareness and reading acquisition (Goldstein, 1976). A meta-analysis of 27 studies by Scarborough reported a correlation of .46 between phoneme awareness and later reading scores (Shapiro, Accardo & Capute, 1998). Phoneme awareness has been shown to be predictive of future reading achievement (Alegria, Pignot & Morais, 1982; Bowey, 2005; Bradley and Bryant, 1983, 1985; Hulme et al., 2002; Liberman & Shankweiler, 1985; Lundberg et al., 1980; Muter et al., 2004; Podhajski et al., 2009; Share et al., 1984; Vervaeke, et al., 2007; Wagner, Torgesen, Loughon, Simmons & Rashotte, 1993) and is a better predictor of reading skill than onset-rime awareness (Hulme et al., 2002). Specifically, Share et al. (1984) found a child’s ability to segment words into phonemes to be an excellent predictor of later reading success in second grade (Muter et al., 1998). In Adam’s 1990 report, *Beginning to Read: Thinking and Learning about Print*, it is stated that using phoneme awareness as a predictor of reading progress is more accurate than using IQ scores. In summary, future reading success can be predicted by phoneme awareness and this predictive relationship continues throughout a student’s school career (Bowey, 2005; Calfee, Lindamood & Lindamood, 1973; Kozminsky and Kozminsky, 1995; Muter et al., 1998; Scarborough, 1998; Snow et al., 1998; Stanovich et al., 1984).

**Intervention studies demonstrate increases in phoneme awareness.** Phoneme awareness intervention studies demonstrate the improvement that can be made in phoneme awareness by young children. Various intervention studies differ with regard to
the type of tasks involved, type of students receiving the intervention, and length of lessons or duration of the intervention. Overall, though, it is clear that phoneme awareness can be increased with explicit instruction (Ball & Blachman, 1991; Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1991; Castles et al., 2009; Cunningham, 1990; Lie, 1991; Lundberg et al., 1988; NRP, 2000; Rupley et al., 2009; Vadasy & Sanders, 2008; Williams, 1980), which leads to significant increases in initial decoding ability. Effective phoneme awareness instruction should include simultaneous instruction that progresses in difficulty in both phoneme segmentation and phoneme blending, and, eventually, connects the phonemes to the letters that represent spoken language sounds (Blachman et al., 2003; NRP, 2000; Spector, 1995).

**Importance of including letter sounds in phoneme awareness instruction.**

Phoneme awareness instruction that includes letter-sound instruction has been found to be more beneficial than phoneme awareness instruction without letter-sound instruction (Ball & Blachman, 1991; Blachman et al., 1994; Bradley & Bryant, 1983; Castles et al., 2009; Fox & Routh, 1984; Kim, 2008; NRP, 2000; Vellutino & Scanlon, 1984). A now classic one-to-one tutoring study in England by Bradley and Bryant (1983, 1985) was the first to find a causal relationship between instruction in phoneme awareness and improved reading and spelling. Bradley and Bryant randomly assigned children to one of four groups. One group was taught to categorize words on the basis of shared sounds (phoneme awareness training), another group was also taught to categorize words on the basis of shared sounds, but they were also taught to use letters to represent the shared sounds (phoneme awareness plus letter-sound training), a third group was taught to categorize words on the basis of semantic categories (e.g., grouping pictures of animals
together), and a control group received no special instruction. Bradley and Bryant found that the group that received the phoneme awareness plus letter-sound training performed significantly better on the reading and spelling outcomes than the control group. However, because this study did not include a letter-sound only group, it was not possible to detect if it was the combination of the two instructional techniques, or the letter-sound training alone that resulted in the improved reading and spelling scores. However, subsequent studies demonstrated the combination of phoneme awareness with letter-sound instruction to be more effective than phoneme awareness instruction alone (Ball & Blachman, 1991; Blachman et al., 1994; Castles et al., 2009; Fox & Routh, 1984; NRP, 2000; Spector, 1995; Vellutino & Scanlon, 1984; Yeh & Connell, 2008).

In another classic study, Ball and Blachman (1991) studied the effects on kindergarten children who were randomly assigned to a treatment or one of two control groups. The students in the treatment group received instruction in phoneme awareness plus letter-sound instruction in small groups of five children. The students in the phoneme awareness treatment group participated in lessons consisting of three parts: a) say-it-and-move-it, b) additional segmentation activities, and c) letter-name and sound instruction. The say-it-and-move-it activity was developed based on the latest research on phoneme segmentation at the time (see Bradley & Bryant, 1985; Elkonin, 1973; Liberman, Liberman, Mattingly, & Shankweiler, 1980). Say-it-and-move-it was created to explicitly and concretely teach the concept of phoneme segmentation by instructing the students to move disks while segmenting words containing one-, two-, or three-phonemes (each disk represents a phoneme and is moved as the child is saying the phoneme). The children then repeat the phonemes blending them back into the original word. The second
part of the lesson consisted of other segmentation activities such as categorizing words by alliteration or rhyme. The final part of each lesson included instruction in letter-sound relationships. The students in one of the control groups received instruction in language activities plus letter-sound instruction (identical to the letter-sound instruction the treatment group received). The students in the other control group received no specialized instruction. After a 7-week intervention (4 times per week, for 7 weeks, 20 minutes per lesson), the treatment group outperformed both control groups on measures of phoneme awareness, reading, and spelling. This study helped solidify the importance of phoneme awareness training when combined with letter-sound instruction.

Providing phoneme awareness instruction. Based on current research, school personnel, such as teachers and teaching assistants, can effectively provide phoneme awareness instruction (Allor, Gansle, & Denny, 2006; Ryder et al., 2008; Vadasy & Sanders, 2008; Vadasy, Sanders, & Peyton, 2006). Blachman and her colleagues (Blachman, Ball, Black, & Tangel, 1994) studied the effectiveness of a phoneme awareness program on small groups of children taught by school personnel rather than by researchers. The classroom teachers participated in training that included implementation of the intervention as well as theoretical background knowledge. The children received training in small groups for a total of 10- to 13-hours of phoneme awareness instruction (15 to 20 minutes per day, 4 days per week for 11 weeks). The lessons included three categories of activities: phoneme segmentation (termed Say-it-and-Move-It), segmentation related activities, and letter name-and-sound instruction. Blachman and colleagues reported that the children who received the intervention significantly outperformed their control peers (who did not receive the phoneme awareness
instruction) on measures of phoneme segmentation, letter names and sound knowledge, reading measures, and spelling. More recently, Gillon (2005) reported that preschoolers with speech impairments made significant gains in phoneme awareness, reading, and spelling after receiving phoneme awareness and letter-sound instruction through simple game activities instructed by trained speech-language pathologists in small therapy groups of two or three children.

**Group Size and Phoneme Awareness Instruction**

There are three common groupings or contexts in which phoneme awareness instruction is regularly conducted: one-to-one or tutoring (normally one teacher and one child), small groups (typically 3 to 5 students and 1 teacher), and whole class instruction (generally 1 teacher and 10 children or more). Research has been conducted on one-to-one, small group, and whole class phoneme awareness instruction, with the largest percentage (49%) of comparisons analyzed by the NRP (2000) involving small groups. Although the NRP found effect sizes to be greater for small group ($d = 1.38$) instruction than for individual ($d = 0.60$) or whole class ($d = 0.67$) instruction, it should be noted that the NRP did not report any studies that manipulated the size of the group receiving instruction and compared the outcomes of children. Consequently, the NRP concluded that, "the next step for researchers is to determine experimentally whether small group instruction is indeed a better way to teach phoneme awareness than individual and classroom instruction" (NRP, 2000, p. 2-44).

In any context, phoneme awareness activities often include games, rhymes, riddles, and songs (Adams, 1990; Allor et al., 2006; Griffith & Olson, 1992; Mattingly, 1984; Yopp, 1992) and can be effectively embedded into repeated book readings
(Barclay, 2009; Ziolkowski & Goldstein, 2008) or alphabet books (Murray, Stahl, & Ivey, 1996; Zeece, 2006). Similar techniques, teaching phoneme segmenting and blending skills in the context of letter sounds and words embedded in storybooks, have been used to teach phoneme awareness to various populations including children with Down syndrome (Goetz et al., 2008). After analyzing 52 studies (96 instructional comparisons), the NRP reports that the most effective phoneme awareness instruction includes instruction in the two phoneme awareness skills of segmenting and blending, is combined with letter sound instruction, and is completed within 20 hours.

**Individual phoneme awareness instruction.** Individual phoneme awareness instruction often takes place in a tutoring situation either in a school or clinic. Individual instruction involves one teacher and one student. The NRP found that the effect size of one-to-one phoneme awareness instruction was moderate ($d = 0.60$) based on a meta-analysis using Cohen’s $d$. For example, Vadasy, Jenkins, Antil, and Wayne (1997) researched the effectiveness of community volunteers implementing phonological awareness lessons to children in first grade. These 30-minute one-to-one tutoring sessions encompassed a wide range of phonological and early literacy activities, including activities such as rhyming, letter-sound instruction, phoneme blending, story reading, and writing. Although the program was written to be easily followed so the lessons could be implemented by minimally trained volunteers (some of whom were high school students), the volunteers who implemented the lessons did so with differing degrees of fidelity, which impacted the results. The tutors were expected to commit to the program for the school year, arrive on time, be present at additional training sessions throughout the year, and conduct the lessons as directed. The students who received instruction from tutors
who adhered to these guidelines achieved greater gains in reading and spelling than the students who did not receive the high level of fidelity in tutoring. Providing that the person instructing the student in phoneme awareness has had adequate training and has some pedagogical understanding, one-to-one instruction can be beneficial to those students who need it.

Phoneme awareness instruction has also been added to Reading Recovery (Clay, 1985) tutoring groups (Hatcher et al., 1994; Iversen & Tunmer, 1993), resulting in similar outcomes on measures of reading, spelling, and phoneme awareness as typical Reading Recovery lessons. However, the children who received the added structured phoneme awareness instruction reached the exiting point of the program in fewer lessons than those who did not receive the added phoneme awareness instruction.

**Small group phoneme awareness instruction.** Almost half of the 96 phoneme awareness research comparisons (49%) analyzed by the NRP involved instruction in small groups of children. Typically, small group phoneme awareness instruction includes three to six students who are instructed by one teacher. Although these studies differed in many ways: tasks, grade levels, and risk level of students (e.g., at-risk, typical learners, or learning disabled), the majority of the phoneme awareness studies of small group instruction were conducted in English in the United States and 60% involved children in kindergarten (e.g., Ball & Blachman, 1991; Blachman, Ball, Black, & Tangel, 1994; Cunningham, 1990; Davidson & Jenkins, 1994; Fox & Routh, 1984; Torgeson, Morgan, & Davis, 1992). The NRP found that the effect size of small group phoneme awareness instruction was high ($d = 1.38$) based on a meta-analysis using Cohen’s $d$. 
Based on the extensive research, it is not surprising that many of these studies have led to clearly identifiable evidence-based practices in the area of phoneme awareness instruction of kindergarten children in the United States. However, since these studies have only been conducted with small groups or individual children, the effectiveness of this type of instruction with whole classes is still unknown.

**Whole class phoneme awareness instruction.** As noted, phoneme awareness instruction can also be provided in a whole class setting. The NRP (2000) found that the effect size of whole class phoneme awareness instruction was moderate ($d = 0.67$) based on a meta-analysis using Cohen’s $d$, which is similar to the effect size noted in the one-to-one tutoring studies ($d = 0.60$), but much lower than that of the small group studies ($d = 1.38$). Research utilizing whole class phoneme awareness instruction demonstrated that phoneme awareness instruction can be effective in whole class settings (Brady, Fowler, Stone, & Winbury, 1994; Brennan & Ireson, 1997; Bus, 1986; Haddock, 1976; Kozminsky & Kozminsky, 1995; Lie, 1991; Lundberg et al., 1988; O’Connor, Notari-Syverson, & Vadasy, 1996, 1998; Olofsson & Lundberg, 1983, 1985; Schneider, Küspert, Roth, Visé, & Marx, 1997; Yeh & Connell, 2008). Similar to many small group and one-to-one studies, the studies implementing whole class instruction reveal increases in measures of reading and spelling. However, with all of the research analyzed by the NRP, only a small percentage of the 96 experimental comparisons (15 percent or a total of 11 studies) of phoneme awareness instruction involved the entire class (also referred to as whole class, whole group or large group instruction). Similar to the small group studies, these whole class studies differed on many accounts, such as the number of skills taught, whether or not letter symbols were utilized, amount of instruction provided, grade and
risk level of students. On the other hand, unlike the small group studies, a majority of the whole class studies cited by the NRP occurred outside the United States with students speaking languages other than English.

The 11 whole class phoneme awareness studies (and their applicable follow-up studies) that were analyzed by the NRP (2000) will be reviewed in the next two sections. It should be noted that only 3 of the 11 studies included letters as part of the phoneme awareness instruction. The majority of the studies (eight) included treatment groups receiving phoneme awareness instruction in a whole class setting with no letters included in the instruction, and these will be examined first.

**Whole class phoneme awareness instruction without letters.** The NRP (2000) analyzed a now classic Swedish study by Olofsson and Lundberg (1983, 1985) that included an experimental study with a longitudinal follow-up. Olofsson and Lundberg investigated the directionality of the relationship between phonological awareness and reading acquisition of children six to seven years old (mean age = 6.11). They were interested in whether phoneme awareness could be successfully increased in kindergarten. The teachers in the three experimental groups chose the amount of structure imposed on the lessons during the 6-8 week intervention (from highly structured to informal). The teachers in the first highly structured phoneme awareness group were supervised and supported in their implementation of the 15- to 30-minute delineated tasks. The teachers in this group presented the tasks to the children in the sequence provided by the researchers. These tasks were implemented three- to four-times per week. The teachers in the second phoneme awareness group were provided the same tasks in the same order, but were not as supervised or supported in their implementation. Due to the
lack of supervision and support by the researchers, the teachers in this second group spent less time implementing the tasks. The teachers in the third phoneme awareness group were supplied a more spontaneous, non-scheduled phoneme awareness program. These teachers were to choose the duration, timing, and frequency of the phoneme awareness activities to teach. One of the two control groups participated in a highly-structured program of nonverbal tasks (listening to a sound and then responding with a movement based on the sound such as running or sitting). The structure, sequence and duration of the program were equivalent to the first experimental group. The second control group followed the normal preschool curriculum. Activities in the phoneme awareness program were introduced playfully as group activities, lasting 15 to 30 minutes per lesson. The activities included in this study were rhyming, segmenting syllables and segmenting phonemes, finding initial phonemes, and adding and deleting phonemes. The activities lent themselves to being reproduced spontaneously by the children, for example following a group activity involving initial phoneme deletion, the children began addressing each other omitting initial phonemes. Only the experimental group that was highly structured produced a significant improvement in segmenting and blending three-phoneme words. One exciting observation made was that "the general impression was that regardless of ability level the children enjoyed the exercises and games very much and were encouraged to approach their language in a playful and creative way that was new to most of them" (Olofsson & Lundberg 1983, p. 43).

In 1988, Lundberg, Frost, and Peterson developed a comprehensive phonological training program for use with the six to seven year old pre-kindergarten children before they started to read and write (Scandanavian children do not enter kindergarten until they
are seven years old). This whole class study included almost 400 Scandinavian preschool students (Lundberg et al., 1988). Classroom teachers underwent extensive training for one year before the study began. After pretesting, the teachers in the experimental group implemented the sequential phonological awareness program for 15 to 20 minutes per day for 8 months. The sequence of the program consisted of listening games (verbal and nonverbal), rhyming games, and sentence and word games. The sequence of tasks consisted of segmenting sentences into words in the first month, focusing on syllables by clapping, dancing, marching, and then representing syllables with chips in the second month, focusing on phonemes in initial positions during the third and fourth months, focusing on phonemes within words during the sixth and seventh months, and playing prosodic games during the eighth month. The control group followed the regular preschool program which did not entail reading instruction. The students who received the intervention produced significantly better results on various metalinguistic measures (rhyming, word and syllable manipulation, and phoneme segmentation and deletion), as well as spelling in grades one and two and word decoding in grade two.

The Scandinavian study by Lundberg, Frost, and Peterson (1988) spawned many replication studies. The NRP (2000) reports one such study conducted by Schneider et al. (1997) in Germany. Schneider et al. actually conducted two replication studies (differing in duration) with German children. The first study followed a program similar to the one developed by Lundberg et al. (1988) (however it was translated into German). The kindergarten children in this study were one year younger (six years old) than their Scandinavian counterparts (Lundberg et al.). In this study teachers in the experimental group would implement the program in 15 to 20 minute sessions daily for 6 months. The
phoneme awareness program, based on Lundberg et al., began slowly with listening games, progressing to games and activities with words, progressing to syllables, and games with phonemes in the end. In this replication study, they found that, similar to the Lundberg study, most children mastered the easier tasks such as sentence and word segmentation quickly. They found that they could have spent less time on segmenting chunks larger than the phoneme and spent more time on analysis and synthesis of phonemes. Unlike Lundberg et al., the teachers did not undergo extensive training prior to the study, nor were they supervised as the teachers were in Lundberg et al.’s study. Over half (13 out of 22) of the teachers did not conduct the program as planned. The program was implemented consistently only during the first half of the study (3 months) by the majority of the teachers, at which point many teachers chose not to continue implementing it with integrity. There were also obstacles surrounding the transfer testing, resulting in the testing taking place after the students began formal reading instruction in first grade, and quite possibly accounting for the lack of significant differences in phonological awareness between control group students and the students who received the training. However, when the results were analyzed, and the groups of students who had teachers who consistently implemented and completed the program were compared to the students who had teachers who did not consistently implement the program, the consistently trained children performed significantly better on the metalinguistic transfer tests.

The second study by Schneider et al. (1997) began later in the kindergarten school year than the first study. The other modifications made to the program were minimal and were comprised of omitting redundant activities and adding more phoneme analysis and
synthesis activities, with the expectation that the teachers were to only implement the lessons for 10 minutes each day. The teachers received more support from the researchers than in the first study and met with them once per week. The control teachers followed the normal kindergarten curriculum. Schneider et al. found that through this modified phonological awareness program (adapted from Lundberg et al., 1988), the kindergarten children made significant gains in phonological skills, reading, and spelling. Schneider et al. determined that early instruction in phonological awareness produces significant effects, regardless of the alphabetic language. The researchers concluded that after the intervention, even though lower skilled children continued to struggle with isolating and blending phonemes, overall, those who began with the lowest pretest scores made the greatest gains in phoneme awareness.

Kozminsky and Kozminsky (1995), in Israel, conducted another replication study of the study by Lundberg et al. (1988). In this longitudinal study of Hebrew children, the relationship between phonological awareness and reading was examined. In addition to the national kindergarten curriculum, the kindergarten experimental group participated in a phonological awareness program (adapted from Lundberg et al., 1988) twice a week with 20-minute whole class activities instructed by a student teacher, who taught multiple phoneme awareness skills without the association of letter symbols. On the other school days, the classroom teacher reviewed the phoneme awareness activities with a 2- to 5-minute practice session. The children also participated in independent phoneme awareness centers during the day. The 8-month program, translated from Danish, consisted of listening games, identifying and creating rhymes, identifying repeated words, dividing sentences into words, reflecting on word length, segmenting words into
syllables or sub-syllabic units, blending syllables into words, blending syllables from
different words and blending sub-syllabic units into words, phoneme segmentation
(initial, middle, then final phoneme), counting syllables, sub-syllabic units, or phonemes
in a word, blending phonemes into a word, and phoneme deletion. The control group
participated in the national general enrichment program and also received instruction in a
visual-motor integration program from a student teacher. These children were only five
years of age when beginning this program, making them more similar to kindergarten
children in the United States who also typically begin kindergarten at age 5. The
phonological test scores showed significant increases for the experimental group, and
ultimately (at the end of first and third grades) the reading comprehension scores also
showed significant differences -- with the experimental group scoring higher than the
control group. Thus, Kozminsky and Kozminsky (1995) found that phoneme awareness
instruction in kindergarten does lead to higher reading comprehension in first grade and
third grade in their study of Hebrew children in Israel.

In 1997, Brennan and Ireson conducted an evaluative study using the program
created by Lundberg et al. (1988) as an experimental condition in an American school in
London. The students in this study were also five years old (an average of two years
younger than the students in the original Scandinavian study, but similar in age to
kindergarten students in the United States). The goal was to see if the original program
(Lundberg et al., 1988) was effective for younger children. Kindergarten classes were
assigned to one of three conditions: (1) the experimental condition using the program
developed by Lundberg and colleagues (phonological awareness group), (2) a control
group that used an informal phoneme awareness program ("Success in Kindergarten,
Reading and Writing," (Adams, Johnson, & Connors, 1980) which provides phonological awareness activities that are not taught in a systematic or sequential order, or (3) a typical kindergarten program control group. As in the original Lundberg et al. study, the students included in the phonological awareness group were taught in a whole class setting for most of the activities. The activities were introduced slowly in 15-minute to 20-minute lessons, introducing phonemes in the third month of instruction. The Success in Kindergarten group also received 20-minute lessons each day. Even though both the phonological awareness group (formal program) and the Success in Kindergarten group (informal phonological awareness program) resulted in significantly greater gains than the typical kindergarten program, Brennan and Ireson found that the students in the formal phoneme awareness program achieved significantly greater gains on phoneme awareness measures than the students in the informal one. Implications of whole class phoneme awareness instruction were noted. Brennan & Ireson (1997) stated:

The games in this program are done with groups of children rather than individual children. This means that this training program has an important advantage over other training programs in phonological awareness in that it is far easier to implement within the classroom context, and fits in better with recent calls for more whole class teaching [in the UK]. (p. 256)

A longitudinal study of children in first grade in Norway explored the effectiveness of a systematic word analysis (or phoneme analysis) training program on reading and spelling outcomes after the training program, and again at a one-year follow-up (Lie, 1991). Lie investigated the differences between two types of auditory word
analysis training (auditory sequential analysis and auditory positional analysis). Students received 10 to 15 minutes per day of an intervention involving either an auditory positional treatment (phoneme isolation or identifying phonemes in initial, medial, or final positions in target words) or an auditory sequential treatment (phoneme segmentation and blending). Students in the auditory positional analysis group listened to stories with the phonemes in initial, middle, and final positions of words, participated by repeating the words and were instructed to focus on analyzing the spoken words. The sequential experimental group participated in the same activities, with the aim to analyze the sequence of the phonemes in the correct order (essentially, segmenting the words into phonemes, and then blending them). Initial phonemes were segmented orally, then the middle, and followed by the final phoneme. Words beginning with continuant consonants were analyzed before words beginning with vowels and words containing two phonemes were analyzed before words containing three phonemes. A control group participated in neutral activities for the same 10 to 15 minutes per day. The neutral activities included discussions of the stories used in the experimental groups, but no instruction in segmenting took place. Lie found that instruction in either type of word analysis focusing on phonemes significantly increased the students’ outcomes in learning to read and spell. However, the students who received the auditory sequential training (segmenting and blending) exhibited better reading and spelling skills than the students who received the auditory positional training. Interestingly, Lie additionally states, "a significant interaction between type of treatment and intelligence suggested that students of lower ability profited the most from the phonological training" (p. 234). This finding suggests that lower skilled children should be included in phoneme awareness training, as opposed
to excluding them from the instruction until their basic academic skills are more advanced. This is in agreement with the findings by Schneider et al. (1997).

Brady, Fowler, Stone, and Winbury (1994) set out to develop a phonological awareness program to use in classrooms in the United States, to understand which abilities influence success in learning phonological awareness, and to see if phoneme awareness instruction affects more than basic phonological awareness tasks. They conducted a longitudinal study evaluating the outcomes of this phonological processing training program that they developed for at-risk children in inner-city kindergartens. The experimental group received instruction from their teachers in this phonological processing training program for 20 minutes, 3 times per week. The 18-week program consisted of 3 phases: phonological awareness above the level of the phoneme, isolating the phoneme, and representing the internal structure of the syllable. General phonological awareness in Phase 1 included instruction and activities in rhyming, alliteration, and syllabification, as well as segmentation of sentences, phrases, and words into syllables, categorization of words which did not belong with the others as well as syllable identification. Phase 2 concentrated on isolating the phoneme and was based on Lindamood’s Auditory Discrimination in Depth (ADD) Program (Lindamood & Lindamood, 1969). This phase focused on how the sounds are produced (articulation awareness) and included similar activities to those in the previous phase, but at the phoneme level instead of the syllable level. Phase 3 made the phonemes more concrete by utilizing an adaptation of the Say-It-and-Move-It activity (Ball & Blachman, 1991). Say-It-and-Move-It is an activity designed to make the abstract concept of phoneme awareness a concrete concept by representing each phoneme with a chip. Each chip is
moved on a board as the word is articulated. The control group continued in their typical whole language curriculum during the study. One item missing from this program was the addition of letters, which the authors recommended adding to future phonological awareness programs. Nonetheless, the students in the phonological awareness training group achieved significantly higher levels of phonological awareness skills than the students who did not receive the same training.

As noted earlier, the studies reviewed above demonstrate that whole class phoneme awareness instruction can be effective. However, the generalizability of the findings to kindergarten students in the U.S. is limited by the fact that only one of the eight studies was conducted in the U.S. Most were conducted in languages other than English, about half included children who were older than typical kindergarten children in the U.S. and none included instruction in letter sounds, an important aspect of instruction that the NRP found to significantly enhance the effectiveness of phoneme awareness instruction. In the next section, three additional whole class studies will be reviewed, all of which included instruction in letter knowledge as part of the phoneme awareness intervention.

*Whole class phoneme awareness instruction with letters.* A Dutch study by Bus (1986) trained kindergarten children (who on average were six years old) in phoneme awareness by different methods (auditory-only and auditory-visual) to determine which method provided greater gains in phoneme awareness. Nine classes were randomly assigned to one of the experimental groups (auditory-only and auditory-visual). The intervention was implemented 20 minutes a day for 20 days, totaling 6 ½ hours of instruction. The auditory-visual group was taught sight words first then phoneme and
visual analysis and blending of the words. This group practiced how the written letters (visual aspects) of the word corresponded with the phonemes (auditory) by showing the written word and then removing a letter and pronouncing the word without that letter. The auditory-only group learned letters and a purely auditory training in analysis and blending. A letter would be introduced, associating it with an animal (such as an “s” being associated with a snake) and a sound. The group also received training in phoneme blending and phoneme analysis (with no letters or visual cues included in this part of the training). The control group continued receiving standard preparatory instruction in reading, involving writing the child’s name, recognizing spoken words, letter and book knowledge. Although the phonemes were presented using different modalities, students in both experimental groups made significantly greater gains than the control students on phoneme analysis and reading measures, regardless of how the phoneme awareness was taught. However, none of the groups made gains on the measure of phoneme blending.

Similar to the study by Bus (1986), Haddock (1976) examined whether auditory or auditory-visual tasks would be more effective at teaching prereaders how to blend words. Haddock’s study was conducted in the United States with preschool children in three different schools. Haddock established two treatment groups of children to participate in phoneme awareness tasks for 10 minutes per day for 3 weeks. One experimental group, the auditory group, practiced blending consonants in both initial and final positions in words. The concept of blending words initially was taught by segmenting the students’ names and asking them whose name was being said. The students would then listen to words, focusing on a consonant being taught (for example for “k” the teacher would say “k --- eep” and the students would respond “keep” or the
teacher would say “fee ----k” and the students would respond with “feek”). This auditory group received instruction with no letters or visual cues present. The auditory-visual group was shown a word printed on a card (for example, “feef”) as the teacher said and pronounced the word. The teacher would then fold the paper so another letter would replace one of the letters in the printed word (for example, a “k” would replace the first “f” in “feef” creating “keef”). As the teacher replaced one letter with another, she would ask the students to tell what the new word was. If assistance was needed, students were referred to a picture card with a picture of a word beginning with that letter (for example, a “k” would have a picture of a key on the picture card), then asked to blend the sound of that letter with the rest of the word. This type of instruction encompassed letters in both initial and final positions of words. The control group received instruction for 10 minutes every day in sound-letter associations, but no blending took place. Criterion testing took place at the end of every 40 minutes of instruction. If blending was considered to be mastered on the criterion test, the student would then go on to the posttest, if mastery was not achieved, then the student would continue to receive instruction the following week. In posttest analysis of the nonword measure, students who received training in auditory-visual tasks outperformed students who received auditory only training as well as the control group. The auditory-only group significantly outperformed the control group on the same reading measure, making it clear that explicit blending instruction is an important factor in reading instruction.

O'Connor et al. (1996, 1998) conducted a kindergarten intervention study with a first-grade longitudinal follow-up, studying the effectiveness of classroom teachers delivering phoneme awareness instruction to kindergarten children with and without
disabilities. They looked at whether or not classroom teachers can incorporate phonological awareness instruction into their regular, whole-group routines, and what effect this instruction will have on phonological, reading, and writing outcomes. This program incorporated two phoneme awareness skills (segmenting and blending phonemes) along with the addition of letters -- as noted by the NRP (2000) these are the most effective elements to be included in phoneme awareness instruction. The teachers received 10 inservice sessions over a 10-month period. The teachers who delivered the instruction had the freedom to regulate the intensity of instruction and structure of the activities, providing short 5- to 15-minute long activities in their whole classes of 21 to 25 students. The teachers in the treatment group delivered activities to the classes ranging from 100 to 281 activities over the 6-month intervention period (97 teaching days). The various activities included word and syllable awareness (months 1-2), rhyming, first sound isolation, onset-rime level blending and segmenting (months 3-4), and addition of letters and sounds to phonological awareness activities (months 5-6). The control groups followed the ordinary district-wide reading program which did not include practice in phoneme blending, segmenting words beyond their initial sounds, or sound-letter correspondence. Both the experimental group and control group included children with disabilities, children repeating kindergarten, and typical kindergarten children in regular kindergarten classrooms, transitional classrooms, and self-contained special education classrooms. Some teachers in the self-contained and transitional classes provided portions of the instruction in small groups, because they had additional personnel in their classrooms and were able to divide into smaller groups. Students in the treatment group made significantly greater gains than the students in the control group on measures of
blending, segmenting, reading, and writing. Although the students with disabilities did make progress, they did not progress to the point of their typical peers, but the effects continued to be seen on reading and writing tests the following year in first grade. The authors suggest that children with disabilities may need an intervention with a longer duration and they might need smaller group instruction to be more successful.

As seen in the three studies just reviewed, generalizability to kindergarten populations continues to be a problem. Although all three studies reinforce the effectiveness of whole class phoneme awareness instruction with letter sounds included, only one of the three included kindergarten children in the U.S. in their study.

**General summary of whole class instruction.** Of the 11 whole class studies reviewed, it is important to note that only three were conducted in the U.S. (whereas most of the small group studies were conducted in the U.S.) and of those three, only two included kindergarten children. Although much can be learned from studies conducted outside the U.S. and in other languages, these characteristics reduce the generalizability to English speaking kindergarten children in the U.S. It is also of interest that of the two kindergarten whole class U.S. studies, only one included letter sounds, a component that increases the effectiveness of phoneme awareness instruction (NRP, 2000). None of the studies directly compared whole class to small group instruction.

**Summary of group size and phoneme awareness literature.** The studies reviewed confirm that phonological awareness, specifically phoneme awareness, influences reading in such a way that it lays a foundation for formal reading instruction. Phoneme awareness can be most successfully taught when the instruction includes both phoneme segmentation and blending activities, as well as instruction in letter names and
sounds (NRP, 2000). These effects have been demonstrated in one-to-one, small group, and whole class instructional settings across a number of different studies. As indicated earlier, the NRP found that, although the effect sizes were larger in studies using small group phoneme awareness instruction than in studies using whole group instruction, there is not sufficient evidence to state which is the best method for delivering instruction. In fact, as noted previously, they report that due to this lack of empirical evidence regarding the influence of group size, "the next step for researchers is to determine experimentally whether small group instruction is indeed a better way to teach phoneme awareness than individual and classroom instruction" (NRP, 2000, p. 2-44).

**Purpose of this Study**

The purpose of this study is to compare whole class and small group phoneme awareness instruction of inner-city kindergarten children and to evaluate the growth of the children in the two different grouping formats in terms of outcome measures of phoneme awareness, letter knowledge, reading, and spelling. The studies that most informed my research were the previously referenced intervention studies by Ball and Blachman (1991) and Blachman, Ball, Black, and Tangel (1994). Both studies implemented phoneme awareness instruction with small groups that was found to be effective in significantly improving outcomes in phoneme awareness, letter knowledge, reading, and spelling. The current study will use the same small group intervention utilized by Blachman and colleagues and will also adapt this intervention for whole class instruction.
Specifically, the following questions will be addressed:

1. Are there differences in phoneme awareness acquisition in children who have received whole class phoneme awareness and letter sound instruction compared to children who have received similar small group instruction?

   Based on the research to date, it is hypothesized that small group instruction will produce better outcomes on phoneme awareness measures than whole class instruction.

2. Are there differences in letter knowledge and in early reading and spelling acquisition in children who have had whole class phoneme awareness with letter sound instruction compared to children who have received similar small group phoneme awareness with letter sound instruction?

   Likewise, based on the research to date, it is hypothesized that small group instruction will produce better outcomes on letter knowledge and reading and spelling acquisition measures than whole class instruction.
Chapter 3

Method

Participants

The participants in this study were kindergarten children selected from two elementary schools within one urban school district in upstate New York. The study received approval from the Institutional Review Board (IRB) of Syracuse University on November 29, 2004. At the time of this study, the elementary schools included children in pre-kindergarten through sixth grade. According to the New York State School Report Card Comprehensive Information Report for the 2003-2004 school year, School A had approximately 700 students, and School B had over 500 students (NYS Report Card Comprehensive Report Card, 2004). Although the schools were in the same district and only differed in location by a few miles, the children in the two schools differed in terms of demographic characteristics as shown in Table 1.
Table 1

*Summary of School Characteristics*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>School A</th>
<th>School B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total student population</td>
<td>700</td>
<td>500</td>
</tr>
<tr>
<td>Received Public Assistance</td>
<td>81% - 90%</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>Free or Reduced Lunch</td>
<td>75.3%</td>
<td>56%</td>
</tr>
<tr>
<td>Minority population</td>
<td>50%</td>
<td>30%</td>
</tr>
<tr>
<td>ELL student population</td>
<td>7.1%</td>
<td>0%</td>
</tr>
<tr>
<td>Reading First Grant</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>


The two schools were selected based on the fact that they were both part of an urban district where I had been granted permission to conduct research. In addition, the two schools were seeking alternative, research-based instruction in early reading. The two instructors for this study (another doctoral student and myself) were currently working as early literacy reading coaches for the first-grade teachers and classes in both of these schools as part of a large National Institutes of Health (NIH) funded grant related to early literacy. Children and classes in the current study were not participants in the NIH grant.
Teachers from intact kindergarten classrooms in both schools volunteered to be involved in this study. There were six kindergarten classes in School A and three kindergarten classes in School B. At the time of this study, some small group phoneme awareness instruction was present in both schools. However, even in classrooms where some phoneme awareness was being provided, the teachers had not yet started phoneme awareness with all of the students in their classes. Having had no previous phoneme awareness instruction was a requirement for students to participate in this study. The condition to which the classrooms were assigned (whole class or small group phoneme awareness instruction) was based on the number of children in that class who had not received phoneme awareness instruction before this study began, as well as the recommendation of the Reading Specialists in each school. All kindergarten classes in both schools followed a balanced literacy approach utilizing a basal series newly adopted by the district.

In school A, one veteran kindergarten teacher had not yet provided any phoneme awareness instruction to her students when first approached about participating in the study. She agreed to allow a certified teacher who was experienced in early literacy and phoneme awareness instruction to provide this instruction to her class as part of this study. A second teacher in School A, teaching kindergarten for the first time, also had not implemented any phoneme awareness instruction with her class. She too agreed to allow a certified, experienced teacher to provide this instruction to her class as part of this study. Taking class schedules and teacher preferences into account, the Reading Specialist then chose which of these two kindergarten classes would receive the
instruction as a whole class and which would receive the instruction in small groups of no more than five students each.

In School B, the majority of kindergarten teachers had received training in providing phoneme awareness instruction to small groups of children using the *Road to the Code* Program (Blachman, Ball, Black & Tangel, 2000) in the previous years. Due to this training and the success seen by the veteran teachers, most were eager to begin providing phoneme awareness instruction to their classes early in the fall. Although beneficial for the children, this made it difficult to locate intact classrooms in School B in which to provide phoneme awareness instruction for the purpose of this study. Between two of the classrooms, 15 children had not received any phoneme awareness instruction, because the teachers were waiting until they had more time in their schedule to work with additional small groups of children. These two teachers agreed to have a certified experienced teacher provide phoneme awareness instruction to these children in small groups. Similar to School A, School B also included a teacher who was new to teaching kindergarten, and thus had not been trained in providing phoneme awareness instruction and was eager to have an experienced, certified teacher provide phoneme awareness instruction to the children in her class. This class was assigned to the whole class instruction condition.

Since it was not possible to randomly choose the children and classes, and due to the fact that the students were mostly from intact classes (see Figure 2), the design of this quasi-experimental study was a nonequivalent group design (Campbell & Stanley, 1967). This study involved two experimental conditions: whole class instruction and small group instruction. Due to the fact that all kindergarten children in Schools A and B (with the
exception of the 66 children who participated in this study) had already begun receiving phoneme awareness instruction prior to the study, no additional children remained in those schools to serve as a comparison or control group.

Sixty-six kindergarten students, between the ages of five and six who attended School A and School B and whose first language was English, were the participants. Although data from students whose first language was not English were excluded from the study, these children still received the instruction, so as not to exclude any child from the class activities. See Figure 2 for a summary of the design elements.

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**Figure 2.** Design elements of study. WCI = Whole Class Phoneme Awareness Instruction. SGI = Small Group Phoneme Awareness Instruction.
Data were collected from 18 children in each of the whole classes in both schools, totaling 36 children in the Whole Class Instruction condition. There were five children in each of the small groups who received instruction, totaling 30 children in the Small Group Instruction condition. All three small groups in School A came from one intact classroom. The three small groups from School B came from two separate classrooms. Data from 33 children were collected from each school, with an equal number of children in each condition.

The small group instruction (SGI) condition, collapsed across schools, consisted of 30 children, including 12 boys and 18 girls. Of the 30 children, 21 were White, 8 were African American, and 1 was Latino. The whole class instruction (WCI) condition, collapsed across schools, consisted of 36 children, including 14 boys and 23 girls. Of the 36 children, 15 were White, 18 were African American, and 4 were Latino. No significant differences were found between the two experimental groups on age, $t (64) = 0.94$, $p = 0.34$ or gender, $\chi^2 (df = 1) > .01$, $p = 0.92$. For race, Chi-square revealed a trend ($p = 0.06$), such that the WCI condition had relatively more African American participants than the SGI condition. There was no attrition during the study, and all analyses were based on 30 children in the SGI condition and 36 children in the WCI condition.

**Procedure**

This study was designed to assess the effect of group size on phoneme awareness instruction as measured by performance on measures of phoneme awareness and early reading and spelling acquisition. Beginning in February, the 66 children who participated in the study were pretested in a separate room from the rest of the class by trained testers.
The pretesting battery included a language screening, a measure of phoneme segmentation, phoneme blending, phoneme elision, letter name and sound knowledge, and word identification. Immediately following the testing was a weeklong break for the school district. Upon return from the school break, the intervention began for both the small group and whole class conditions. Each group received 40, 30-minute lessons in phoneme awareness, over a 10-week period. In May, at the end of the 10-week instructional period, a posttest battery was administered. This battery differed only slightly from the initial pretest battery. The language screening measure was not included in the posttest battery (since it was used as an initial screening only) and three posttest-only measures -- measures of phonetically regular word and nonword reading and a measure of developmental spelling -- were added (see Table 2).
### Table 2

**Pretest and Posttest Batteries**

<table>
<thead>
<tr>
<th>Pretest Battery</th>
<th>Posttest Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language screening: KLST-2</td>
<td></td>
</tr>
<tr>
<td>Phoneme segmentation: PSEG</td>
<td>Phoneme segmentation: PSEG</td>
</tr>
<tr>
<td>Phoneme blending: CTOPP Blending</td>
<td>Phoneme blending: CTOPP Blending</td>
</tr>
<tr>
<td>Phoneme elision: CTOPP Elision</td>
<td>Phoneme elision: CTOPP Elision</td>
</tr>
<tr>
<td>Letter name and sound knowledge</td>
<td>Letter name and sound knowledge</td>
</tr>
<tr>
<td>Word identification: WRMT-R</td>
<td>Word identification: WRMT-R</td>
</tr>
<tr>
<td>Phonetically regular word reading: PRW-I</td>
<td></td>
</tr>
<tr>
<td>Phonetically regular nonword reading: PRW-II</td>
<td></td>
</tr>
<tr>
<td>Developmental spelling test: DST</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* KLST-2 = Kindergarten Language Screening Test-2; PSEG = Phoneme Segmentation Test; CTOPP = Comprehensive Test of Phonological Processing; WRMT-R = Woodcock Reading Mastery Test – Revised.

**Pretesting.** Pretesting was conducted in February prior to the winter break for the school district. All pretests (see Table 2) were administered by four certified elementary teachers trained in administering this specific testing battery. All testers participated in training with an individual trained in administering these tests for another,
larger study. Each tester participated in administering practice tests and did not perform any testing of children in this study until they reached competence (100% accuracy on test administration).

**Small group instruction.** The 30 students in this condition came from one intact kindergarten classroom from School A (n = 15) and a combination of students from two separate kindergarten classrooms from School B (n = 15) (see Figure 2). Each small instructional group was comprised of five students. The small groups were conducted in a quiet area of the classroom, while the rest of the class participated in their regular daily language arts activities with the classroom teachers.

The lessons were taught 4 days per week, for 10 weeks (totaling 40 lessons). Each lesson lasted about 15 to 20 minutes and was based on research conducted by Blachman and colleagues (1994). The research-based program is published in a manual entitled *Road to the Code* (RTTC) (Blachman et al., 2000), and the RTTC manual with the scripted lessons was used for the small group instruction. The original RTTC program has demonstrated a high level of success (Blachman et al., 1994) and is easy to implement. In keeping with the progression of lessons in the manual, there were three parts to each lesson conducted in this study.

The first part of each lesson from *Road to the Code* (Blachman et al., 2000) focuses on phoneme awareness, utilizing an activity known as Say-It-and-Move-It. This is the core of the program, which uses concrete objects (small disks) to represent the phonemes in spoken words. Since phoneme awareness is an oral language concept, it is made concrete by having children move the small disks or chips for each sound they hear in a spoken word. This activity is used to help children segment spoken words into
phonemes and then blend the phonemes together into naturally spoken words. The teacher first says a sound or word and the students repeat the word. Next, the teacher models how to stretch out the word, or say it slowly, so each sound can be heard (e.g., sssssuuunnnn), while moving a disk for each sound from the top of the page to a line at the bottom of the page. As the lessons and skill levels progress, printed letters are added to the chips to associate how spoken sounds are represented in print.

The second part of each lesson from *Road to the Code* is a letter name and sound activity. Eight letters and their sounds are taught during the 40 lessons. The letters are taught in the following order: a, m, t, i, s, r, b, and f. The letters in the program were chosen by Blachman and colleagues due to the fact that many phonetically regular, consonant-vowel-consonant (CVC) words can be created with them. This enables children to read and spell real words early in the program. Some of the activities in this section include: saying the sound of the given letter, providing words that begin with the letter, participating in handclapping games, chants or rhymes about the letters, and coloring pictures of the given letter and key word.

The third part of each lesson in the *Road to the Code* (Blachman et al., 2000) program involves a phonological awareness practice activity to reinforce and expand different aspects of phonological awareness. Some of the activities include: rhyming, using a puppet to practice phoneme blending (the teacher uses the puppet to tell a short story including words that were drawn out and the students help the puppet blend the sounds together), playing sound bingo (a word beginning with a certain sound would be called and the letter matching that sound would be covered), and using Elkonin Cards -- large cards with a line-drawn picture on the top and a horizontal rectangle comprised of
three boxes at the bottom of the card into which round chips would be placed to segment
the sounds of the picture at the top of the card (Elkonin, 1973).

**Whole class instruction.** The published manual, *Road to the Code (RTTC)*
(Blachman, Ball, Black, & Tangel, 2000), was the basis for the whole class lessons as
well as the small group lessons. I modified these lessons for use with a whole class. The
objectives for each part of the original lesson were kept intact, while the activities were
adapted to take into account the larger number of students and whole class format the
lesson would take. The adapted lessons were piloted in a kindergarten class in a private
school in the same city the semester prior to the implementation of this study. Alterations
were made to the lessons based on feedback from the students and teacher of the pilot
study, resulting in the lessons used for this study.

In the current study, the modified whole class *Road to the Code* lessons were
taught to the whole class at one time (typically about 20 students in each class). All
whole class lessons followed the same three-part format as the original Road to the Code
small group lessons: 1) Say-it-and-Move-It, 2) letter name and sound instruction, and 3) phonological awareness practice. Many of the lessons were kept virtually intact, only
increasing the size or amount of materials or increasing the number or varying the
movement of practice items to allow more children in the whole class to have an
opportunity to respond and be involved, as suggested by Kamil and Rauscher (1990). In
general, the length of the whole class lessons was increased to almost double that of the
small group lessons, making the whole group lessons last roughly 30 to 35 minutes each,
4 days per week. Iversen et al., (2005) found that it may be necessary to increase the
duration of each lesson when modifying lessons to suit a larger group to increase
opportunities for interaction and additional practice. Although the lessons were modified, the objectives for small group and whole class lessons were the same. (A comparison chart of selected small group and whole class lessons is available in Appendix A).

The most significant way that the lessons were altered, besides the length of the lessons, was in the materials. For example, in the small group model, each child and teacher utilizes his or her own Say-It-and-Move-It board, which is an 8 ½” x 11” laminated card, placed in front of each individual on the table. Each child moves ½” plastic chips or disks to convey the number of sounds in a spoken word. In the whole class format, the board was enlarged to over 4 feet tall to enable it to be seen easily by all children in the whole class. The movable chips were increased to 6” in diameter, again, easily manipulated on the large board and readily seen by the whole class.

In the whole class lessons, the activity of Say-It-and-Move-It was kept nearly intact with the addition of extra practice items to increase opportunities for student participation (as suggested by Iversen et al., 2005). The students were all seated on the floor as opposed to at a table. After the teacher modeled the concept, one child was selected to move the chips on the large board and demonstrate to the whole class the number of sounds in a spoken word. While this student was demonstrating to the rest of the class, several different forms of interaction would take place to provide more opportunities for the children to be involved and stay motivated. For example, one way the rest of the class would interact would be to “be the chip.” In this activity, the students in the whole class would stand up and crouch down slowly as they said the sound of the phoneme either at the same time as, or after the student who was demonstrating, slid the
large chip down the board while saying the phoneme. This one activity had many variations throughout the lessons to keep the class focused and increase interaction.

**Instructor qualifications and training.** The instructors for the SGI and WCI (another doctoral student in education and myself) were certified and experienced elementary school teachers with extensive training in the implementation of both the original *Road to the Code* Program (Blachman et al., 2000) as well as the modified whole class version of *Road to the Code*. At the time of this study, both instructors were working as consultants and Early Literacy Support Specialists for first-grade teachers, aiding in the implementation of a research-based reading program. To simplify matters, the instructors were assigned to the schools based on the schools in which they were currently working as Early Literacy Support Specialists. This arrangement eased the transition time between their roles as Early Literacy Support Specialists and instructors for this study. Even though they were coaching first-grade teachers, during the year that this study was conducted, neither instructor worked with any of the kindergarten teachers or students involved in this study.

The author, who served as one of the instructors, designed the whole class version of the *Road to the Code* program, and trained the other instructor extensively on the implementation of this version of the phoneme awareness program. The training of the instructor focused on practicing with the new materials and any novel components to the program. The two instructors met weekly to discuss and practice the upcoming lessons and communicated daily regarding the lessons via email and/or phone conversations. Instruction in the implementation totaled more than 10 hours. To reduce instructor bias, each instructor instructed half of the children in each condition. That is, one instructor
provided both small group and whole class instruction at School A and one instructor provided both small group and whole class instruction at School B. For the analysis, the small group students from both schools were collapsed into one condition and the whole class students were collapsed into a second condition.

**Treatment fidelity.** Independent observations of each instructor were conducted 6 times during the 10-week intervention. Each instructor was observed 3 times teaching a whole class lesson and 3 times teaching a small group lesson. The observer underwent reliability training to ensure procedural integrity and was experienced in providing these observations as part of an earlier large NIH funded study. During the observations, she monitored the sequence of activities during the lessons and how closely the lessons matched the printed versions of the lessons. Based on these observations, it was determined that there was 100% compliance for each instructor regarding adherence to the treatment protocol.

**Measures**

The purpose of this study was to assess the effect of group size on phoneme awareness instruction as measured by student achievement in phoneme awareness, early reading acquisition, and spelling. All assessment measures are listed in Table 2. Initially, the Kindergarten Language Screening Test-2 (KLST-2) (Gauthier & Madison, 1998) was administered to all children as a screening measure of verbal ability to ensure equivalence of the groups. Before the instruction began, the 66 children who participated in the study were pretested using a battery including measures of varying aspects of phoneme awareness (Phoneme Segmentation, CTOPP Blending and CTOPP Elision), letter name and sound knowledge, and word reading ability (WRMT-R Word Identification). At the
end of the intervention, a posttest battery was administered to all of the children. The posttest battery did not include the language screening measure (KLST-2) which was only used as a measure to equate groups at the start of the intervention. However, all other pretest measures were included. Three additional posttest-only measures were included in the posttest battery. Two measures were used to assess reading of Phonetically Regular Words (PRW-I) and Nonwords (PRW-II) (Ball & Blachman, 1991; Blachman et al., 1994), and a third measure was used to assess spelling with the Developmental Spelling Test (DST) (Tangel & Blachman, 1992; Ball & Blachman, 1991). With exception of the KLST-2 and the two CTOPP phoneme awareness measures, all other measures were also used by Blachman and colleagues (Ball & Blachman, 1991; Blachman et al., 1994).

The assessments were administered by testers who had been trained in these specific test batteries and who were blind to the condition of the children. The assessments were administered to individual children in a quiet area in the school designated by the school personnel for testing, and the battery took about 35 minutes per child.

**Pretest-only measure.** In order to assess aspects of general language ability, the Kindergarten Language Screening Test-2 (KLST-2) (Gauthier & Madison, 1998) was administered. The KLST-2 was chosen as an alternative to the more frequently administered Peabody Picture Vocabulary Test-III (Dunn & Dunn, 1997) or the Receptive One Word Picture Vocabulary Test (Brownell, 2000) due to the fact that these tests had previously been administered to the children as part of the kindergarten screening and developmental testing battery administered in this school district. An
advantage to utilizing the KLST-2 was that it reduced the administration time of the battery. The KLST-2 only takes 5 to 10 minutes to administer. The KLST-2 also possessed adequate psychometric properties for screening the children on language ability. Items on the test include stating name and age, color recognition, counting and pointing, body part identification, following commands, identification of prepositions, stating similarities and differences, sentence imitation, picture arrangement, and a spontaneous speech sample. Based on Cronbach's coefficient alpha, the total reliability for the KLST-2 is 0.88, with 0.81 for ages 5-0 through 5-11. Extensive validity information is documented in the test manual (Gauthier & Madison, 1998).

**Pretest and posttest measures.** Pretest and posttest batteries included measures of phoneme awareness, letter names and sounds, and word reading.

**Phoneme awareness.** To measure phoneme awareness, three measures were administered, including the Elision subtest and the Blending Words subtest from the Comprehensive Test of Phonological Processing (CTOPP) (Wagner, Torgesen, & Rashotte, 1999), as well as a shortened version of the Phoneme Segmentation Test (PSEG) (see Ball & Blachman, 1988; 1991). The PSEG was chosen instead of the segmentation subtest of the CTOPP because the segmentation subtest of the CTOPP was not normed for five year old children.

**Elision.** The Elision subtest measures the extent to which an individual can repeat a word, and then repeat it a second time while leaving off a designated part of the word, resulting in a different word. The subtest begins with compound words. For example, the examiner might say, “Say the word ‘bookbag,’ now say it again without saying the word ‘book.’” The correct response would be “bag.” The harder items on the subtest involve
simple words in which the examiner might say, “Say the word ‘meat,’ now say it again without saying the /m/.” The correct response would be “eat.” All items, as well as answers, are real words. The testing ends when the student responds incorrectly three consecutive times. The profile/examiner record booklet is the only item needed for administration of this test. Reliability, based on Cronbach's coefficient alpha, is .90 for five year old children and 0.92 for six year old children. Validity information for the CTOPP Elision subtest can be found in the test manual (Wagner, Torgesen, & Rashotte, 1999).

**Blending.** The Blending Words subtest measures how well a student can blend individual phonemes/sounds to form a word. The words are provided on a cassette tape from the publisher to eliminate differences in administrators’ pronunciation of words. For example, the individual on the cassette tape might say, “What word do these sounds make: /b/-/oi/?” The correct response would be “boy.” The testing ends when the student responds incorrectly three consecutive times. The materials needed to conduct this measure are the profile/examiner record booklet, the testing cassette tape and a tape player. The reliability coefficient is .88 for five year old children and 0.89 for six year old children. Validity information for the CTOPP Blending subtest is provided in the test manual (Wagner, Torgesen, & Rashotte, 1999).

**Segmentation.** The Phoneme Segmentation Test (PSEG) (Ball & Blachman, 1988; 1991) measures how well a child can segment one-, two-, or three-phoneme items, using a concrete representation for each sound. For example, after an initial coaching period, the student is asked to move a chip for each sound he or she hears in a spoken word, providing a concrete representation for each phoneme. All test items were
presented in a fixed random order during the assessment. One point was recorded for each correct response. To administer the PSEG test, a Say-It-and-Move-It board and plastic chips are used, as well as a record sheet.

The original PSEG included 34 randomly arranged one-, two-, or three-phoneme items (Ball & Blachman, 1988). The internal reliability of this measure was reported to be 0.91 (Ball & Blachman, 1988). A shortened version of the PSEG was used for the present study, including 22 items. The 12 items that were omitted did not alter the ratio of one-, two-, or three-phoneme items from the original test. In addition, the directions were simplified and only half as many practice/training trials were administered in order to shorten the duration of the battery. The internal reliability of the shortened version of the PSEG was acceptable at pretest (Cronbach’s coefficient alpha = 0.85; Spearman-Brown split-half = 0.82) and at posttest (Cronbach’s coefficient alpha = 0.84; Spearman-Brown split-half = 0.89). For these reasons, the 22-item version of the PSEG was considered to be adequately reliable for formal testing of the hypotheses of the present study.

**Letter name and sound knowledge.** A test of letter name and sound knowledge (Ball & Blachman, 1991; Blachman, Tangel, Ball, Black, & McGraw, 1999) was administered as a pretest and a posttest to assess knowledge of letter names and sounds. This test is comprised of a card for each of the 26 letters in the alphabet. The cards are presented in a fixed random order, and the student is asked to state the name of the letter and the sound it makes. Only the letter cards and record sheet are needed when administering this test. The interrater reliability for this measure is reported to be \( r = 0.997 \) (Ball & Blachman, 1991).
**Word reading.** Word reading ability was assessed using the Word Identification subtest of the Woodcock Reading Mastery Test - Revised (Woodcock, 1987) as both a pretest and a posttest. The Word Identification subtest includes a total of 106 words in which the student is shown a word and asked to read it. The words are presented in a graded list format. The test is discontinued after 6 consecutive incorrect responses. The split-half reliability coefficient for the Word Identification subtest is reported to be $r = 0.97$ (Woodcock, 1987). Validity information is also documented in the test manual (Woodcock, 1987).

**Posttest-only measures.** Additional word reading and spelling were added as posttest-only measures.

**Word reading.** The test of Phonetically Regular Word Reading (PRW-I) and the test of Phonetically Regular Nonword Reading (PRW-II) (Ball & Blachman, 1991; Blachman et al., 1994) were given as posttest-only measures to assess the ability to read words and nonwords. Nonwords or pseudowords resemble words comprised of phonetically regular letter combinations, but have no inherent meaning attached, such as “bem” or “lut.” On both the PRW-I and PRW-II Tests, the student is asked to read each printed word. The PRW-I includes 16 phonetically regular words comprised of the 8 letters introduced during the program (a, m, t, i, s, r, b, f). The PRW-II includes 10 phonetically regular nonwords in which half of the nonwords are comprised of the 8 letters introduced during the program, and the other half of the nonwords included one letter that had not been introduced during the program. The lists of words and the record sheets are the only items necessary to administer these tests.
**Spelling.** A developmental spelling test (DST) (Tangel & Blachman, 1992; Ball & Blachman, 1991) was administered as a posttest-only measure to assess invented spelling. Students were asked to write 5 different words (lap, sick, pretty, train, and elephant). Points (ranging from 0 to 6) were awarded for each word based on the number of phonemes that were represented correctly and how closely the spelling captures the phonetic structure of the word (see Tangel & Blachman, 1992, for a complete description of this test). Only the list of words and a recording sheet and pencil for each child is needed. Tangel & Blachman report an interrater reliability of $r = 0.98$, for this measure.
Chapter 4

Results

This chapter will present the results in the following order. First, demographics and language screening are presented to establish equivalence of groups at baseline. Second, hypothesis testing follows to determine differences between small group instruction (SGI) and whole classroom instruction (WCI) from pretest to posttest in phonological awareness, letter knowledge, word identification, reading, and spelling. Finally, this chapter ends with a summary of major findings.

Preliminary Analyses

Data preparation and statistical assumptions. Prior to analyses of the data, all data were examined for completeness, accuracy, and distributional characteristics. The data were found to be complete (there are no missing data) and were initially inspected to be sure all data were scored correctly. Data were entered using a double-entry method to ensure accuracy before conducting exploratory or inferential statistics. No data entry errors were found.

Exploratory data analysis (Howell, 2004; Tabachnick & Fidell, 2007; Tukey, 1977) was conducted prior to testing the hypotheses. Exploratory data analysis included histograms, box-plots, stem-and-leaf plots, and tests of normality, to supplement visual inspection of the data. Exploratory data analysis is important, including testing the assumptions of the inferential statistical tests to be used in the study (Howell, 2004; Tabachnick & Fidell, 2007; Tukey, 1977).
The assumptions of ANOVA were investigated in the present study. The crucial assumption of ANOVA is independence (Howell, 2004; Tabachnick & Fidell, 2007). Independence was fostered in the present study by testing participants individually in one-on-one testing sessions, so that the scores of one participant would not affect the scores of other participants.

Using the threshold of three standard deviations (Tabachnick & Fidell, 2007), no outliers were detected. Because the participants were young, early literacy learners, it is not surprising that floor effects were evident on some variables (Micceri, 1989), resulting in significant positive skew (skew / skew SEM > 2) (Howell, 2004; SPSS, 2007) and significant kurtosis (kurtosis / kurtosis SEM > 2) (Howell, 2004; SPSS, 2007). Specifically, many scores were at or near the bottom of the scale for CTOPP elision and blending, and for letter names and WRMT. Negative kurtosis was evident for PRW and Developmental Spelling, indicating a flatter distribution for these variables compared to a bell-shaped curve.

However, ANOVA is robust against violation of the minor assumptions of shape (Howell, 2004; Tabachnick & Fidell, 2007). Further, square root and inverse linear transformations (Tabachnick & Fidell, 2007; Tukey, 1977) were conducted, but failed to ameliorate the significant skew and kurtosis from floor effects, and more importantly, did not change the substantive findings of the present study. Lastly, Levene's test of homogeneity of variance (Brown, & Forsythe, 1974; Howell, 2004; Tabachnick & Fidell, 2007) detected no statistically significant heterogeneity in the data.

Because the assumptions of independence and homogeneity of variance were met, because ANOVA is robust against violations of minor assumptions, and because linear
transformations failed to change the substantive results, the assumptions of ANOVA were fostered in the present study.

**Demographics and Equivalence at Baseline**

To establish equivalence of groups at baseline, participant groups were contrasted on gender, race, age, and performance on the Kindergarten Language Screening Test – 2 (KLST-2), a language screening tool. Validating equivalence of groups at baseline was an important preliminary step before employing the phoneme awareness intervention in either whole class (WCI) (n = 36) or small group instructional (SGI) (n = 30) settings.

**Gender.** Gender was well distributed across groups. In the SGI group, 18 of 30 participants (60%) were female and 12 of 30 participants (40%) were male, while 22 of 36 participants (61%) in the WCI group were female and 14 of 36 participants (39%) were male. This difference was not statistically significant, $\chi^2 (df=1) = 0.01, p = .92$. These findings confirmed equivalence of groups in gender. Gender frequencies by group are displayed in Table 3.
### Table 3

*Gender Data by Instructional Group*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Descriptive</th>
<th>Instructional Group</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SGI</td>
<td>WCI</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Count</td>
<td>18</td>
<td>22</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Gender</td>
<td>45.00</td>
<td>55.00</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Group</td>
<td>60.00</td>
<td>61.11</td>
<td>60.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>27.27</td>
<td>33.33</td>
<td>60.61</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Count</td>
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<td>14</td>
<td>26</td>
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</tr>
<tr>
<td></td>
<td>% within Gender</td>
<td>46.15</td>
<td>53.85</td>
<td>100</td>
<td></td>
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<tr>
<td></td>
<td>% within Group</td>
<td>40.00</td>
<td>38.89</td>
<td>39.39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>18.18</td>
<td>21.21</td>
<td>39.39</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>30</td>
<td>36</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Gender</td>
<td>45.45</td>
<td>54.55</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% within Group</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>45.45</td>
<td>54.55</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* SGI = small group instruction; WCI = whole class instruction.
Race and ethnicity. Race and ethnicity data were obtained using information supplied by the parents to the schools. The parent-reported racial and ethnic origin information was generically defined by the school district as consisting of four broad categories, blurring the lines between race and ethnicity. Students were labeled as either: (1) American Indian, Alaskan, Asian, or Pacific Islander, (2) Black (not Hispanic), (3) Hispanic, or (4) White (not Hispanic). Table 4 shows that in the SGI group, 21 of 30 participants (70%) were White, 8 of 30 participants (27%) were Black or African American, and 1 of 30 participants (3%) was Hispanic. In the WCI group, 15 of 36 participants (42%) were White, 17 of 36 participants (47%) were Black or African American, and 4 of 36 participants (11%) were Hispanic. A 2x3 (group by race/ethnicity) Chi-square revealed trend level differences in race/ethnicity between the groups $\chi^2 (df = 2) = 5.54, p = .06$. Further 2x2 calculations revealed that Black or African American and Hispanic participants were not significantly disproportionate by group, $\chi^2 (df = 1) = 0.29, p = .60$, and that White and Hispanic participants were not significantly disproportionate by group, $\chi^2 (df = 1) = 2.59, p = .11$. However, White and Black or African American participants were significantly disproportionate by group, $\chi^2 (df = 1) = 4.10, p < .05$, such that the WGI group had relatively fewer White students per Black or African American student compared to the SGI group. Race frequencies by group are displayed in Table 4.
Table 4

*Race and Ethnicity Data by Instructional Group*

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Descriptive</th>
<th>SGI</th>
<th>WCI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Count</td>
<td>21</td>
<td>15</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>% within Gender</td>
<td>58.33</td>
<td>41.67</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>% within Group</td>
<td>70.00</td>
<td>41.67</td>
<td>54.55</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>31.82</td>
<td>22.73</td>
<td>54.55</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Count</td>
<td>8</td>
<td>17</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>% within Gender</td>
<td>32.00</td>
<td>68.00</td>
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<td></td>
</tr>
<tr>
<td>% within Group</td>
<td>26.67</td>
<td>47.22</td>
<td>37.88</td>
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<tr>
<td>% of Total</td>
<td>12.12</td>
<td>25.76</td>
<td>37.88</td>
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<tr>
<td>Hispanic</td>
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<tr>
<td>Count</td>
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<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>% within Gender</td>
<td>20.00</td>
<td>80.00</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>% within Group</td>
<td>3.33</td>
<td>11.11</td>
<td>7.58</td>
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</tr>
<tr>
<td>% of Total</td>
<td>1.52</td>
<td>6.06</td>
<td>7.58</td>
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</table>

(continued)
### Instructional Group

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Descriptive</th>
<th>SGI</th>
<th>WCI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>30</td>
<td>36</td>
<td>66</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>% within Gender</td>
<td>45.45</td>
<td>54.55</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>% within Group</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>45.45</td>
<td>54.55</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

*Note. SGI = small group instruction; WCI = whole class instruction*

**Age.** Groups were similar in age. The SGI group averaged 5.70 years of age (SD = 0.25) and WCI group averaged 5.80 years (SD = 0.30). This difference was not statistically significant, t (64) = 0.94, p = .34. These findings confirmed equality of groups in age prior to intervention. Data regarding age are displayed in Table 5.
Table 5

*Age and Language Screening by Instructional Group*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instructional Group</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>SGI</td>
<td>5.70</td>
<td>0.25</td>
<td>0.94</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>WCI</td>
<td>5.76</td>
<td>0.30</td>
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<td></td>
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<td>KLST-2</td>
<td>SGI</td>
<td>36.83</td>
<td>23.44</td>
<td>0.66</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>WCI</td>
<td>33.18</td>
<td>21.34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* SGI = small group instruction; WCI = whole class instruction; KLST-2 = Kindergarten Language Screening Test-2.

**Language screening.** Prior to the intervention, the Kindergarten Language Screening Test-2 (KLST-2) (Gauthier & Madison, 1998) was administered as a language screening measure to establish equality of groups at baseline. The SGI group participants averaged 36.83 (SD = 23.44) on the KLST-2 and WCI group averaged 33.18 (SD = 21.34). This difference was not statistically significant, $t = 0.66$, $p = .51$. These findings confirmed equality of groups prior to the intervention. Data regarding the KLST-2 language screening are displayed in Table 5.

**Summary of baseline data.** To establish equivalence of groups at baseline, participant groups were contrasted in gender, race, age, and the KLST-2, a language screening tool. Groups were equivalent in gender, with roughly 60% females and 40%
males in each group. There was a trend within race towards relatively more White participants in the SGI, while the WCI group had relatively more African American and Latino participants. Groups were equivalent in age and in language screening. Overall, these findings confirmed equivalence of groups prior to investigation of the hypotheses explored in the present study.

**Hypothesis Testing**

To evaluate the possibility of significant learning advantages of small group instruction (SGI) compared to whole class instruction (WCI), participants were assessed prior to and following the phoneme awareness with letter sound instruction. These pretest and posttest repeated measures were obtained for phoneme awareness, letter knowledge, and word identification. Additional reading and spelling scores were obtained at posttest-only.

For each repeated measure, the following steps were taken. First, groups were contrasted at baseline using a between groups t-test. Similarly, a between groups t-test was used to test differences between groups at posttest. ANCOVA was then utilized to determine significant differences between groups at posttest with the effects of the pretest scores covaried out. A two-by-two repeated measures ANOVA was conducted for two reasons: first, to assess the overall main effect of time to infer learning, and second, because a statistically significant time x group interaction would indicate that the SGI and WCI groups learned at different rates. Group differences were assessed for each posttest-only measure, with a between groups t-test. Although multiple statistical analyses were conducted, no correction was made to the analyses because significance was never observed. Because of the importance of not missing real differences (type-II error) in this
new area of research, no corrections were made for multiple comparisons (Motulsky, 2010; Rothman, 1990). Each statistical outcome is presented in the context of supporting or not supporting the hypothesis of a significant advantage of SGI over WCI, in addition to determining whether significant learning was evident overall across participating kindergarten students. Results are displayed in tables and line graphs to augment outcomes with explanations provided in the text.

Effect size over time is expressed as Cohen's $d$ (Cohen, 1988), which was calculated by dividing the difference between means by the adjusted posttest standard deviation for each group. Cohen’s $d$ analyses express the effect size of time (pre-post) using three categories: small (0.2), moderate (0.5), and large (0.8) (Cohen, 1988). Effect sizes contrasting posttest differences between groups were calculated by dividing the adjusted means difference by the adjusted standard deviation of the WGI (control) group (Glass's Delta) (Glass, McGaw, & Smith, 1981).

Results are organized by variables, starting with phoneme awareness, letter knowledge, and word identification, and then turning to posttest-only reading and spelling scores. For each variable, a summary of findings is provided. This chapter ends with a summary of major findings.

**Phoneme Awareness**

Phoneme awareness was measured using assessments of phoneme segmentation, phoneme blending, and phoneme elision. The Phoneme Segmentation assessment (PSEG) (Ball & Blachman, 1988, 1991) measures how well students are able to determine the number of phonemes in spoken words. The Blending subtest (CTOPP-Blending) (CTOPP, Wagner et al., 1999) measures the ability of the student to blend
orally-presented phonemes into words. The Elision subtest (CTOPP-Elision) (CTOPP, Wagner et al., 1999) evaluates the student’s ability to manipulate syllables and phonemes in spoken words.

**Phoneme segmentation.** The Phoneme Segmentation assessment (PSEG) was administered as a pretest and as a posttest. The SGI and WCI participants were similar at baseline. The SGI group averaged 8.90 ($SD = 5.52$) and the WCI group averaged 9.31 ($SD = 5.10$). This difference was not statistically significant, $t = 0.31$, $p = 0.76$. The SGI group ($M = 15.00$, $SD = 4.56$) and WCI group $M = 15.31$ ($SD = 4.62$) were similar at posttest, $t = 0.27$, $p = 0.79$ (see Appendix B). These results show that the groups did not begin with significantly different scores on the PSEG measure, and that groups were not significantly different after the intervention on the PSEG.

Using the pretest of the PSEG as a covariate, ANCOVA revealed no significant differences between the groups on the posttest PSEG assessment, $F(1, 63) = 0.01$, $p = 0.91$ (see Table 6). Large effects of time were observed in both the SGI ($d = 1.61$) and WCI ($d = 1.53$) groups on the PSEG. A two-by-two repeated measures ANOVA ($time \times group$) revealed no significant main effect of group $F(1, 64) = 0.11$, $p = 0.74$ and no significant $group \times time$ interaction, $F(1, 64) = 0.01$, $p = 0.93$. As detailed in Appendix C and displayed in Figure 3, scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 107.93$, $p < .0001$. 
Table 6

*Means and Adjusted Means for Phoneme Awareness Measures*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Posttest Means Adjusted by Pretest</th>
<th>Posttest Standard Deviation Adjusted by Pretest</th>
<th>Cohen’s d</th>
<th>Glass’s Δ</th>
<th>Effect Size Between Groups at Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M^a</td>
<td>SD^b</td>
<td>d</td>
<td>F</td>
<td>p</td>
</tr>
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<td>PSEG</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGI</td>
<td>8.9</td>
<td>5.52</td>
<td>15.0</td>
<td>4.56</td>
<td>15.11</td>
<td>3.86</td>
<td>1.61</td>
</tr>
<tr>
<td>WCI</td>
<td>9.31</td>
<td>5.1</td>
<td>15.31</td>
<td>4.62</td>
<td>15.22</td>
<td>3.86</td>
<td>1.53</td>
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<td>CTOPP-blending</td>
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<td></td>
</tr>
<tr>
<td>SGI</td>
<td>9.00</td>
<td>2.35</td>
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<td>1.9</td>
<td>8.59</td>
<td>1.58</td>
<td>0.26</td>
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<tr>
<td>WCI</td>
<td>8.44</td>
<td>2.37</td>
<td>8.92</td>
<td>1.65</td>
<td>9.01</td>
<td>1.57</td>
<td>0.36</td>
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<tr>
<td>CTOPP-elision</td>
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<td></td>
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</tr>
<tr>
<td>SGI</td>
<td>8.67</td>
<td>2.11</td>
<td>9.70</td>
<td>2.44</td>
<td>9.56</td>
<td>1.73</td>
<td>0.51</td>
</tr>
<tr>
<td>WCI</td>
<td>8.33</td>
<td>2.35</td>
<td>9.47</td>
<td>2.47</td>
<td>9.59</td>
<td>1.73</td>
<td>0.73</td>
</tr>
</tbody>
</table>

*Note.* PSEG = Phoneme Segmentation Test; SGI = small group instruction; WCI = whole class instruction.

^a^Posttest means adjusted by pretest. ^b^Posttest standard deviation adjusted by pretest.

^c^Cohen’s d; the effect size of change over time (pre-post). ^d^Glass’s Δ, effect size between groups at posttest.
Figure 3. Phoneme Segmentation (PSEG) pretest and posttest means for small group instruction (SGI) and whole class instruction (WCI).

These findings indicate that the scores increased from pretest to posttest and that the participants learned phoneme segmentation at similar rates regardless of being in a whole class or small group for instruction. These findings did not support the hypothesis that small group instruction would result in greater gains than instruction in the whole class setting.

**Phoneme blending.** The Blending subtest of the Comprehensive Test of Phonological Processing (CTOPP) was administered as a pretest and as a posttest. The SGI and WCI participants were similar at baseline. The SGI group averaged 9.00 ($SD = 2.35$) and the WCI group averaged 8.44 ($SD = 2.37$). This difference was not statistically significant, $t = 0.95, p = 0.35$. The SGI group ($M = 8.70, SD = 1.90$) and WCI group ($M = 8.51,}$
8.92, \(SD = 1.65\) were similar at posttest, \(t = 0.50, p = 0.62\) (see Appendix B). These results demonstrate that the groups did not begin with significantly different scores on the Blending subtest of the CTOPP measure, nor were the scores significantly different from each other after the intervention on this posttest measure of phoneme awareness. Although it should be noted that the SGI scores decreased mildly from pretest to posttest, this drop was not statistically significant.

Using the pretest of the CTOPP-Blending subtest as a covariate, ANCOVA revealed no significant differences between the groups on the posttest Blending subtest of the CTOPP, \(F (1, 63) = 1.11, p = 0.30\) (see Table 6). However, Cohen’s \(d\) (1992) analyses revealed that there were small effects of time observed in both the SGI (\(d = 0.26\)) and WCI (\(d = 0.36\)) groups on the Blending subtest. A two-by-two repeated measures ANOVA (\(time \times group\)) revealed no significant main effect of group \(F (1, 64) = 0.15, p = 0.70\) and no significant group \(\times time\) interaction \(F (1, 64) = 2.05, p = 0.16\) for the Blending subtest of the CTOPP. As detailed in Appendix C and displayed in Figure 4, scores of both groups did not significantly increase from pretest to posttest, as revealed by no significant main effect of time \(F (1, 64) = 0.10, p = 0.75\).
These findings indicate that participants did not improve in the phoneme awareness skill of blending, regardless of whether the participants were in a small group or whole class instructional setting. These findings did not support the hypothesis that small group instruction would result in greater gains than instruction in the whole class setting.

**Phoneme elision.** SGI and WCI participants were similar at baseline on the Elision subtest of the Comprehensive Test of Phonological Processing (CTOPP). The SGI group averaged 8.67 ($SD = 2.11$) and the WCI group averaged 8.33 ($SD = 2.35$). This difference was not statistically significant, $t = 0.61, p = 0.55$. The SGI group ($M = 9.70, SD = 2.44$) and WCI group ($M = 9.47, SD = 2.47$) were also similar at posttest, $t = 0.38, p = 0.71$ (see Appendix B). Groups did not begin with significantly different scores.
on the CTOPP-Elision measure, nor were the scores significantly different after the intervention on this measure of phoneme manipulation.

Using the pretest of the Elision subtest of the CTOPP as a covariate, ANCOVA revealed no significant differences between the groups on the posttest Elision subtest of the CTOPP, $F(1, 63) = .01, p = 0.94$ (Table 6). Moderate effects of time were observed in both the SGI ($d = 0.51$) and WCI ($d = 0.73$) groups on the Elision subtest. A two-by-two repeated measures ANOVA ($time \times group$) revealed no significant main effect of group $F(1, 64) = 0.06, p = 0.60$ and no significant $group \times time$ interaction, $F(1, 64) = 0.06, p = 0.81$. Scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 24.31, p < .0001$ (see Appendix C). Figure 5 displays CTOPP Elision pretest and posttest means for SGI and WCI groups.
These findings indicate that participants learned phoneme elision at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that small group instruction would result in greater gains by students than the whole class instruction.

**Summary of phoneme awareness.** Both groups received instruction in phoneme awareness with letter-sound instruction in either a small group or a whole class. The PSEG and CTOPP-Elision scores significantly increased between pretest and posttest for both groups. Neither group improved significantly in blending. These findings did not support the hypothesis that small group instruction would result in greater gains than instruction in the whole class setting. Regardless of whether whole class or small instructional group was used, significant learning effects of training were observed. These findings demonstrate large, significant learning effects for both groups of training.
on phoneme segmentation (SGI, $d = 1.61$; WCI, $d = 1.53$), moderate effects for both
groups on phoneme elision (SGI, $d = 0.51$; WCI, $d = 0.73$), and small effects for both
groups on phoneme blending (SGI, $d = 0.26$; WCI, $d = 0.36$), by the criteria of Cohen
(1988).

**Letter Knowledge**

Another measure of early literacy includes knowledge of letters and sounds. Simple assessments were administered to measure the number of letter names (LN) and letter sounds (LS) each student knew before the intervention and after the intervention. These findings were analyzed in terms of total scores as well as by consonant knowledge (Consonant Letter Names [CLN] and Consonant Letter Sounds [CLS] respectively) and vowel knowledge (Vowel Letter Names [VLN] and Vowel Letter Sounds [VLS] respectively).

**Letter names.** The letter name assessment (LN) scores for the SGI and WCI participants were similar at baseline. The SGI group averaged 16.67 ($SD = 8.17$) and the WCI group averaged 16.11 ($SD = 8.09$). This difference was not statistically significant, $t = 0.28$, $p = 0.78$, across either group. The SGI group ($M = 20.93$, $SD = 6.14$) and WCI group ($M = 19.06$, $SD = 7.41$) were also similar at posttest, $t = 1.11$, $p = 0.27$ (see Appendix B). These results show that the groups did not begin with significantly different scores on the LN measure, nor were the scores significantly different from each other after the intervention on this measure of general letter name knowledge.

Using the pretest of the letter names assessment as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the LN, $F(1, 63) = 2.01$, $p = 0.16$ (see Table 7). Large to medium/large effects of time were observed
in both the SGI \((d = 0.94)\) and WCI \((d = 0.72)\) groups on the LN. A two-by-two repeated measures ANOVA \((time \times group)\) revealed no significant main effect of group \(F(1, 64) = 0.48, p = 0.49\) and no significant \(group \times time\) interaction \(F(1, 64) = 1.10, p = 0.30\). Scores significantly increased across both groups from pretest to posttest, as revealed by the significant main effect of time \(F(1, 64) = 32.77, p < .0001\) (see Figure 6 and Appendix C).
Table 7

Means and Adjusted Means for Letter Knowledge Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pretest</th>
<th>Posttest</th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
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Note. LN = Letter name knowledge; CLN = consonant letter name test; VLN = vowel letter name test; LS = Letter sound knowledge; CLS = consonant letter sound test; VLS = vowel letter sound test; SGI = small group instruction; WCI = whole class instruction.

\(^a\)Posttest means adjusted by pretest. \(^b\)Posttest standard deviation adjusted by pretest.

\(^c\)Cohen’s \(d\); the effect size of change over time (pre-post). \(^d\)Glass’s \(\Delta\), effect size between groups at posttest.

**Figure 6.** Letter names pretest and posttest means for small group instruction (SGI) and whole class instruction (WCI).

These findings indicate that participants learned letter names at similar rates regardless of being in a whole class or small instructional group setting. These findings
did not support the hypothesis that small group instruction would result in greater gains than whole class instruction.

**Consonant names.** The SGI and WCI participants were similar at baseline on the consonant portion of the letter names (CLN) assessment. The SGI group averaged 13.03 ($SD = 6.86$) and the WCI group averaged 12.56 ($SD = 6.69$). This difference was not statistically significant, $t = 0.29, p = 0.78$ (see Appendix B). The SGI group ($M = 16.73$, $SD = 5.14$) and WCI group ($M = 15.31$, $SD = 6.07$) were similar at posttest, $t = 1.02, p = 0.31$ (see Appendix B). These results show that the groups did not begin with significantly different scores on the CLN measure, nor were the scores significantly different after the intervention on this measure of consonant letter name knowledge.

Using the pretest of the CLN assessment as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the CLN, $F(1, 63) = 2.01, p = 0.16$ (Table 7). Large effects of time were observed in both the SGI ($d = 0.99$) and WCI ($d = 0.81$) groups on the LNC assessment. A two-by-two repeated measures ANOVA ($time \times group$) revealed no significant main effect of group $F(1, 64) = 0.43, p = 0.51$ and no significant group x time interaction $F(1, 64) = 0.83, p = 0.37$. Scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 38.12, p < .0001$ (see Figure 7 and Appendix C).
These findings indicate that participants learned consonant names at similar rates regardless of being in whole class or small instructional group settings. These findings did not support the hypothesis that small group instruction would result in greater gains than whole class instruction.

**Vowel names.** The SGI and WCI participants were similar at baseline on the vowel portion of the letter names assessment (VLN). The SGI group averaged 3.63 (SD = 1.52) and the WCI group averaged 3.56 (SD = 1.52). This difference was not statistically significant, \( t = 0.21, p = 0.84 \) (see Appendix B). The SGI group (\( M = 4.20, SD = 1.16 \)) and WCI group (\( M = 3.75, SD = 1.46 \)) were similar at posttest, \( t = 1.37, p = 0.18 \) (see Appendix B). These results show that the groups did not begin with significantly different
scores on the VLN measure, nor were the scores significantly different after the intervention on this measure of vowel letter name knowledge.

Using the pretest of the VLN as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the VLN, $F(1, 63) = 2.80, p = 0.10$ (see Table 7). Moderate to small effects of time were observed in both the SGI ($d = 0.56$) and WCI ($d = 0.22$) groups on the VLN assessment. A two-by-two repeated measures ANOVA ($time \times group$) revealed no significant main effect of group $F(1, 64) = 0.66, p = 0.42$ and no significant group $x$ time interaction $F(1, 64) = 1.75, p = 0.19$. Scores significantly increased across both groups from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 7.31, p = 0.01$ (see Appendix C and Figure 8).
These findings indicate that participants learned vowel names at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that small group instruction would result in greater gains than students in the whole class instructional setting.

**Letter sounds.** The letter sound assessment (LS) was administered as a pretest and as a posttest. The SGI and WCI participants were similar at baseline. The SGI group averaged 10.5 ($SD = 8.99$) and the WCI group averaged 11.67 ($SD = 8.27$). This difference was not statistically significant, $t = 0.55, p = 0.59$ (see Appendix B). The SGI group ($M = 15.17, SD = 8.55$) and WCI group ($M = 16.89, SD = 7.78$) were similar at posttest, $t = 0.86, p = 0.40$ (see Appendix B). These results demonstrate that the groups

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Figure 8. Vowel letter name (VLN) pretest and posttest means for small group instruction (SGI) and whole class instruction (WCI).
did not begin with significantly different scores on the letter sound measure, nor were the scores significantly different after the intervention on this measure of general letter sound knowledge.

Using the pretest of the LS as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the LS assessment, \( F (1, 63) = 0.53, p = 0.47 \) (see Table 7). Large effects of time were observed in both the SGI \((d = 1.19)\) and WCI \((d = 1.10)\) groups on the LS assessment. A two-by-two repeated measures ANOVA \((time \times group)\) revealed no significant main effect of group \( F (1, 64) = 0.53, p = 0.47 \) and no significant \(group \times time\) interaction \( F (1, 64) = 0.24, p = 0.63\). Scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time \( F (1, 64) = 75.03, p < .0001\) (see Appendix C and Figure 9).
These findings indicate that participants learned letter sounds at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that students receiving phoneme awareness instruction in a small group would make greater gains than students receiving instruction in the whole class setting.

**Consonant sounds.** The SGI and WCI participants were similar at baseline on the consonant portion of the letter sounds assessment (CLS). The SGI group averaged 8.90 (SD = 7.50) and the WCI group averaged 9.75 (SD = 6.70). This difference was not statistically significant, $t = 0.47, p = 0.63$ (see Appendix B). The SGI group ($M = 12.90, SD = 6.95$) and WCI group ($M = 13.97, SD = 6.35$) were similar at posttest, $t = 0.65, p = \ldots$
0.52 (see Appendix B). These results reveal that the groups did not begin with significantly different scores on the CLS measure, nor were the scores significantly different after the intervention on this measure of consonant letter sound knowledge.

Using the pretest of the CLS as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the CLS, $F(1, 63) = 0.20, p = 0.65$ (see Table 7). Large effects of time were observed in both the SGI ($d = 1.23$) and WCI ($d = 1.10$) groups on the CLS assessment. A two-by-two repeated measures ANOVA ($time \times group$) revealed no significant main effect of group $F(1, 64) = 0.35, p = 0.56$ and no significant $group \times time$ interaction $F(1, 64) = 0.57, p = 0.81$. Scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 76.27, p < .0001$ (see Appendix C and Figure 10).

![Figure 10](image.png)

*Figure 10. Consonant sound (CLS) pretest and posttest means for small group instruction (SGI) and whole class instruction (WCI).*
These findings indicate that participants learned consonant sounds at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that small group instruction would result in greater gains than whole class instruction.

**Vowel sounds.** The SGI and WCI participants were similar at baseline on the vowel portion of the letter sounds assessment (VLS). The SGI group averaged 1.6 ($SD = 1.69$) and the WCI group averaged 1.92 ($SD = 1.75$). This difference was not statistically significant, $t = 0.74, p = 0.46$ (see Appendix B). The SGI group ($M = 2.27, SD = 1.86$) and WCI group ($M = 2.92, SD = 1.65$) were similar at posttest, $t = 1.51, p = 0.14$ (see Appendix B). These results show that the groups did not begin with significantly different scores on the VLS measure, nor were the scores significantly different after the intervention on this measure of vowel letter sound knowledge.

Using the pretest of the VLS as a covariate, ANCOVA revealed no significant differences between the groups on the posttest of the VLS, $F(1, 63) = 1.92, p = 0.17$ (see Table 7). Based on Cohen’s $d$ analyses (1992), moderate effects of time were observed in both the SGI ($d = 0.65$) and WCI ($d = 0.73$) groups on the LSV assessment. A two-by-two repeated measures ANOVA (*time x group*) revealed no significant main effect of group $F(1, 64) = 1.48, p = 0.23$ and no significant *group x time* interaction $F(1, 64) = 1.09, p = 0.30$. Scores significantly increased across both groups from pretest to posttest, as revealed by the significant main effect of time $F(1, 64) = 27.27, p < .0001$ (see Appendix C and Figure 11).
Figure 11. Vowel sound (VLS) pretest and posttest means for small group instruction (SGI) and whole class instruction (WCI).

These findings indicate that participants learned vowel sounds at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that small group instruction would result in greater gains than whole class instruction.

Summary of letter knowledge. Both of the groups (SGI and WCI) made significant gains on the letter name and letter sound assessments between pretest and posttest. There were no significant differences between groups on any of the letter name or sound assessments. Both groups exhibited significant learning effects of training. These findings demonstrate large or moderate/large significant learning effects of time across both groups on training of letter names (SGI, $d = 0.94$; WCI, $d = 0.72$) and sounds (SGI, $d = 1.19$; WCI, $d = 1.10$) overall. Consonant names (SGI, $d = 0.99$; WCI, $d = 0.81$)
and consonant sounds (SGI, $d = 1.23$; WCI, $d = 1.10$) held small effects of time across both groups using the criteria of Cohen (1988). Both groups demonstrated moderate or small learning effects of time on vowel names (SGI, $d = 0.56$; WCI, $d = 0.22$) and moderate learning effects of time on vowel sounds (SGI, $d = 0.65$; WCI, $d = 0.73$). These findings did not support the hypothesis that students receiving phoneme awareness instruction in a small group would result in greater gains than students in whole class settings.

**Word Reading**

The Word Identification subtest of the Woodcock Reading Mastery Test-Revised (WRMT-R) was administered before the intervention as a pretest and after the intervention as a posttest to measure each student’s ability to read common words.

**Word identification.** The SGI and the WCI participants were similar at baseline on the Word Identification subtest of the Woodcock Reading Mastery Test-Revised (WRMT-R). The SGI group’s standard score mean was 94.4 ($SD = 11.87$) and the WCI group’s standard score mean was 91.5 ($SD = 10.33$). This difference was not statistically significant, $t = 1.06, p = 0.29$ (see Appendix B). The SGI group ($M = 102.53, SD = 12.77$) and WCI group ($M = 96.86, SD = 21.23$) were similar at posttest, $t = 1.28, p = 0.20$ (see Appendix B). These results show that the groups did not begin with significantly different scores on the WRMT-R measure, nor were the scores significantly different after the intervention on this measure of word identification.

Applying the pretest of the WRMT-R as a covariate, ANCOVA revealed no significant differences between the groups on the posttest WRMT-R, $F (1, 63) = .61, p = .44$ (see Table 8). Moderate effects of time were observed in both the SGI ($d = 0.46$) and
WCI \((d = 0.47)\) groups on the Word Identification subtest. A two-by-two repeated measures ANOVA \((time \times group)\) revealed no significant main effect of group \(F (1, 64) = 1.75, p = .19\) and no significant \(group \times time\) interaction \(F (1, 64) = 0.64, p = 0.43\). Scores across both groups significantly increased from pretest to posttest, as revealed by the significant main effect of time \(F (1, 64) = 15.06, p < .0001\) (see Figure 12 and Appendix C).

Table 8

Means and Adjusted Means for Word Identification Measures

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*Note.* WRMT-R = Woodcock Reading Mastery Test – Revised; SGI = small group instruction; WCI = whole class instruction.

\(^a\)Posttest means adjusted by pretest. \(^b\)Posttest standard deviation adjusted by pretest.

\(^c\)Cohen’s \(d\); the effect size of change over time (pre-post). \(^d\)Glass’s \(\Delta\), effect size between groups at posttest.
These findings indicate that participants learned to identify words at similar rates regardless of being in a whole class or small instructional group. These findings did not support the hypothesis that small group instruction would result in greater gains than whole class instruction.

**Summary of word identification.** Both the SGI Condition and the WCI Condition made significant gains between the pretest and posttest word identification assessments. Based on Cohen’s $d$ analyses (1988), moderate effects were observed in both the SGI ($d = 0.46$) and WCI ($d = 0.47$) groups on the word identification assessment. However, there were no significant differences found across both groups on this assessment. This analysis does not support the hypothesis that students in the small group would make greater gains than students in the whole class instructional setting.
Posttest-Only Reading and Spelling

The early literacy activities of reading and spelling were additionally assessed using posttest-only measures. The Phonetically Regular Word Test (PRW-I) assesses the number of phonetically regular words that can be read by the student. The Phonetically Regular Nonwords Test (PRW-II) looks at how many nonwords can be read by the student and the Developmental Spelling Test (DST) assesses the level of sophistication of a child’s early spelling, giving partial credit using a 0-6 point scale for number of phonemes represented.

**Phonetically regular words.** Both the SGI group ($M = 5.53, SD = 6.21$) and WCI group ($M = 6.58, SD = 6.19$) were similar at posttest, $t = 0.69, p = 0.50$ (see Table 9) on the posttest-only measure of Phonetically Regular Word Reading (PRW-I). These findings did not support the hypothesis that small group instruction would result in better reading outcomes than whole class instruction.
Table 9

*Means for Reading and Spelling Posttest-Only Measures*

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</table>

*Note.* PRW-I = Phonetically Regular Words test; PRW-II = Phonetically Regular Nonwords test; DST = Developmental Spelling Test; SGI = small group instruction; WCI = whole class instruction.

*Phonetically regular nonwords.* Both the SGI group ($M = 2.97, SD = 4.19$) and WCI group ($M = 3.47, SD = 3.89$) were similar at posttest, $t = 0.51, p = 0.61$ (see Table 9) on the posttest-only measure of Phonetically Regular Nonword Reading (PRW-II). These findings did not support the hypothesis that students receiving phoneme awareness instruction in small groups would have better reading outcomes than students receiving whole class instruction.
Developmental spelling. Both the SGI group ($M = 17.3, SD = 10.46$) and WCI group ($M = 17.67, SD = 10.01$) were similar at posttest, $t = 0.15, p = 0.89$ (see Table 9) on the posttest-only measure of Developmental Spelling (DST). This analysis does not support the hypothesis that students in the small group condition would have better spelling outcomes than students in the whole class condition.

Summary of posttest-only reading and spelling. Both groups were similar on posttest-only measures of reading and spelling. These findings did not support the hypothesis of an advantage of SGI over WGI.

Chapter Summary

In the present study of the effects of whole class versus small group instruction on phoneme awareness, letter knowledge, word identification, and reading and spelling, groups were similar at baseline in age, gender distribution, and language ability.

The first hypothesis stated that the students receiving small group instruction would significantly outperform the students receiving whole class instruction on measures of phoneme awareness. This hypothesis was not supported. Overall, both whole class and small instructional groups performed similarly. Cohen’s $d$ analyses (1988) revealed large effect sizes for both groups on the phoneme segmentation measure, moderate effect sizes for both groups on the measure of elision, and small effects for both groups in phoneme blending. Significant learning from pretest to posttest was evident for aspects of phonological awareness including phoneme segmentation and phoneme elision for both groups, but whole class and small groups performed similarly at pretest and at posttest for each measure. No significant gains were evident for either group on the measure of phoneme blending.
The second hypothesis was that the small instruction group would significantly outperform the whole class group on measures of reading and spelling. This hypothesis was not supported either. Overall, both whole class and small instructional groups performed similarly. Cohen’s $d$ analyses (1988) revealed large effect sizes for both groups on measures of consonant names, overall letter sounds, and consonant sounds, moderate effect sizes for both groups on measures of overall letter names, vowel sounds, and word identification, and small effects for both groups on the vowel name measure. Significant learning from pretest to posttest was evident for letter names and sounds as well as word identification. Groups were similar at posttest for phonetically regular word reading, phonetically regular nonword reading, and on the developmental spelling test. While these findings provide no empirical evidence supporting the hypothesis of greater outcomes in small group instruction compared to whole classroom instruction, both groups demonstrated similar performance, indicating the phoneme awareness plus letter-sound instruction was effective across both groups.
Chapter 5

Discussion

The present study investigated the effects of small group instruction in phoneme awareness compared to whole class phoneme awareness instruction. This chapter begins with a review of major findings. The general discussion focuses on the theoretical and practical importance of phoneme awareness instruction, including implications of the present findings. This chapter ends with limitations of the present study and areas for future research.

Review of Major Findings

This study of kindergarten children found that phoneme awareness with letter sound instruction significantly improved phoneme awareness (specifically, phoneme segmentation and elision), letter name and sound knowledge, and word identification. These findings are consistent with conclusions that phoneme awareness instruction that includes instruction in letter sounds increases phoneme segmentation ability (Blachman et al., 1999; Brady et al., 1994; Brennan & Ireson, 1997; Bus, 1986; Cunningham, 1990; Ehri & Roberts, 2006; Kozminsky & Kozminsky, 1995; NRP, 2000; O’Connor et al., 1996, 1998; Snow et al., 1998; Yeh & Connell, 2008), letter knowledge (Ball & Blachman, 1991; Blachman et al., 1994; Castles et al., 2009; Ehri & Nunes, 2002; Hatcher et al., 2004; O’Connor et al., 1998) and word identification (Anthony & Lonigan, 2004; Blachman et al., 1999; Brady, et al., 1994; Ehri, Nunes, Willows et al., 2001; NRP, 2000). The most important finding was that across all measures, results were generally
similar for both conditions. That is, there was not an advantage for small group instruction (SGI) over whole class instruction (WCI).

**Phoneme Awareness**

Phoneme awareness scores increased similarly for both the whole class condition and for the small group condition in the present study. This large effect (~1.6 $SD$s) was similar to the findings of Blachman and colleagues, (Ball and Blachman, 1991; Blachman et al., 1994; Blachman et al., 1999), who found similar effect sizes (1.49 - 1.83 $SD$s) in their studies of phoneme awareness training with kindergarten children (NRP, 2000). The present findings replicate these studies of small group instruction and extend them to include whole class instruction.

**Phoneme segmentation.** In the present study, phoneme segmentation scores increased similarly for both the whole class condition and for the small group condition. This was similar to the findings of Ball & Blachman, 1991; Blachman et al., 1994; Bradley & Bryant, 1983, 1985; Bus, 1986; Brady et al., 1994; Brennan & Ireson, 1997; Cunningham, 1990; Hatcher et al., 2004; Kozminsky & Kozminsky, 1995; Lundberg et al., 1988; O’Connor et al., 1996; Yeh & Connell, 2008). The present findings are consistent with the conclusions that phoneme awareness instruction can increase students’ ability to segment words into phonemes.

**Phoneme elision.** In the present study, phoneme elision scores increased similarly for both the whole class condition and for the small group condition. Increases in phoneme elision were also found by Rosner (1974) in his study of phoneme awareness training with four and five year old children and O’Connor et al. (1996) who found similar results with kindergarten children with and without disabilities.
**Phoneme blending.** No significant change on the phoneme blending task was evident in the present study for either the whole class condition or for the small group condition. This finding was not consistent with the findings of O’Connor et al. (1996, 1998) who found increases on phoneme blending scores in their studies of kindergarten children with and without disabilities. The present study used oral blending methods as documented by Ball and Blachman (1991) as a minor element of the phoneme awareness program (occurring explicitly in only 10 out of over 130 lesson activities), while others spent more time on blending instruction (Rosner, 1974). Future research will be required to determine the optimal techniques for teaching phoneme blending to kindergarten children.

**Letter Names and Sounds**

In the present study, the students in both the small group and whole class conditions who received the phoneme awareness plus letter sound instruction increased in letter name and sound knowledge. This is consistent with findings from Ball and Blachman (1991), Blachman et al. (1999), and Blachman et al. (1994). The addition of letter symbols to the instruction is found to lead to greater gains in letter name and sound knowledge and reading than phoneme awareness instruction without letter symbols (Ehri, Nunes, Stahl, & Willows, 2001; NRP, 2000). These findings not only replicate findings from small group instruction, but extend the findings to include whole class instruction.

**Word Reading and Spelling**

In the present study, the students who received the phoneme awareness instruction increased in word identification ability. The children in both groups demonstrated similar ability (whether delivered in whole class or small group conditions) to read and spell
phonetically regular words and nonwords. This is consistent with research by numerous authors (see, for example, Bhat, Griffin, and Sindelar, 2003; Ehri, Nunes, Willows et al., 2001; Vadasy & Sanders, 2008; and Vervaeke et al., 2007). Similar to these studies, the present study included letter symbols in the phoneme awareness instruction. Again, it is important to note that the addition of letter symbols to the instruction is found to lead to greater gains in word reading than phoneme awareness instruction without letter symbols (Ball & Blachman, 1991; Ehri, Nunes, Willows et al., 2001; Ryder et al., 2008). Both groups were also able to demonstrate their knowledge of phoneme awareness and letter sounds in their writing of the developmental spelling words. Again, there was no difference between groups on this posttest-only measure. The present study extends previous small group findings to include results from whole class instruction.

**Summary of Major Findings**

Although the National Reading Panel (2000) found that the effect sizes were larger in studies using small group phoneme awareness instruction than in studies using whole class instruction, there was not sufficient evidence to state which was the optimal group size because no study had directly compared whole class and small group instruction. In fact, the NRP reported that due to the lack of empirical evidence regarding the influence of group size, "the next step for researchers is to determine experimentally whether small group instruction is indeed a better way to teach phoneme awareness than individual and classroom instruction" (NRP, 2000, p. 2-44). In the decade since the National Reading Panel reported its findings, no new studies could be found in the literature that directly explored this issue. In the present study, by comparing the outcomes of students receiving the same phoneme awareness program but in different
group sizes (and with adaptations for a whole class presentation), it is clear that the option of implementing this program in either a small group or whole class is viable, increasing the instructional delivery options for teachers. This study is consistent with the findings reported by the NRP and others: phoneme awareness increases reading acquisition and phoneme awareness can be increased with instruction (see, for example Blachman 2000; Castles et al., 2009; Yeh & Connell, 2008).

General Discussion

Phonological awareness research dates back to the 1960s. During this period, phonological awareness was identified as “sound analysis” (Bruce, 1964). Research on the manipulation of the sounds of words led to the more inclusive term “phonological awareness.” Phonological awareness skill is now understood to progress along a continuum, ranging from rhyming to manipulating syllables to manipulating phonemes (Adams, 1990; Chard & Dickson, 1999; Perfetti & Beck, 1982; Phillips et al., 2008; Sensenbaugh, 1996; Yopp, 1988).

Studies have shown that phoneme awareness is critical for early reading acquisition (Adams, 1990; Liberman, 1971, 1973; NRP, 2000; Snow et al., 1998). Reading ability and phoneme awareness have a reciprocal relationship (Perfetti et al., 1987). Initial reading ability increases the level of phoneme awareness which in turn increases reading ability (Ball & Blachman, 1988; Bradley & Bryant, 1983; Castles et al., 2009; NRP, 2000; Snow et al., 1998; Stanovich, 1986). Effective phoneme awareness instruction includes instruction in segmentation and blending with the inclusion of letter symbols (Ball & Blachman, 1991; Liberman & Liberman, 1990; NRP, 2000; Torgesen, Wagner, & Roshotte, 1997). The present study included the most effective elements of a
phoneme awareness program in both the small group and whole class conditions. This study specifically replicated the methodology and outcomes of the small group study by Ball and Blachman (1991) and demonstrated that the outcomes can be extended to include whole class instruction. This current study produced effect sizes in both small group and whole class instruction that were not different from the effect sizes of the small group phoneme awareness instruction reported by the NRP (2000).

Phoneme awareness continues to be an active area of research. Research on the knowledge of phoneme awareness that teachers possess and the type of professional development necessary to encourage its implementation in the classroom is of concern, since there is evidence that even recent graduates lack knowledge in this area (Cheesman et al., 2009; McGee & Ukrainetz, 2009; Podhajski et al., 2009; Pufpaff, 2009). Another area of investigation is how other school personnel, such as diagnosticians (Chappell, Stephens, Kinnison, & Pettigrew, 2009), music teachers (Gromko, 2005), and speech-language pathologists (Schuele & Boudreau, 2008) can be utilized to impart this important instruction to the children who need it most. The benefits of phoneme awareness instruction for English Language Learners (ELLs) is also being explored (Dodd, So & Lam, 2008; Kim, 2008, 2009; Pollard-Durodola & Simmons, 2009)

Implications

As noted by the NRP (2000), there had not been any direct comparisons of similar small group and whole class phoneme awareness instruction to determine whether differences in group size influenced the effectiveness of phoneme awareness instruction as evidenced by students’ outcomes on phonological awareness, reading, and spelling. Evidence from this study indicates that whole class phoneme awareness instruction can
be as effective as small group phoneme awareness instruction. This new finding might encourage more teachers to include systematic phoneme awareness instruction in their kindergarten classrooms, making this instruction available to more students (Brennan & Ireson, 1997). As noted earlier, even though phoneme awareness is important, many teachers find it difficult to implement (McGee & Ukrainetz, 2009). Without full-time assistants or paraprofessionals in the classroom, it is often challenging for kindergarten teachers to provide small-group research-based instruction. Since phoneme awareness can be taught in large groups, more children could be taught in less overall time, providing additional classroom time for other aspects of beginning reading instruction. Initiating whole class phoneme awareness instruction at the beginning of the year, and monitoring progress, allows the teacher, professional (Schuele & Boudreau, 2008) or paraprofessional (Allor et al., 2006; Vadsy & Sanders, 2008) to identify those students who are successful in acquiring this skill and those who need further instruction. The subgroup needing further instruction could then receive additional small group instruction from the teacher, reading specialist, or teacher assistant, requiring fewer resources than providing small group instruction to the whole class initially.

**Limitations**

The present study was limited by some of the characteristics of the sample. All participants were from two elementary schools within one urban school district in upstate New York, random sampling was not an option, and a control group was not possible with the constraints imposed on this study. Although in this study there was no control group, both groups demonstrated similar results. Replication of the study with larger,
more representative samples, including a control group will be necessary to further investigate the effect of group size on phoneme awareness instruction.

This study was also limited by the design. While one strength of the study was assessing students at both pre- and post-intervention, the study included no long-term follow-up. Without longitudinal designs, we cannot determine whether small group or whole class instruction may confer benefits that were not apparent immediately following the intervention, such as enhanced retention over time and superior application of skills in reading, as well as transfer to reading and spelling.

Nonequivalent instructional time is another factor that should be taken into account when interpreting the results of the study. Children in the whole class condition received twice as much instruction (30 min/session) as the children in the small group condition (15 min/session). However, the whole class was four times as large as the small groups, meaning that the small groups received more teacher time per pupil (3 min/per student/per session) than the whole classroom groups (0.75 min/per student/per session). Although the small group received less instructional time as a group, they received more instructional time per student. Although nonequivalence of instructional time may have been a limitation of the present study, this is consistent with Iversen et al. (2005) who found that it may be necessary to increase the duration of lessons when modifying lessons for instruction provided to larger groups.

**Areas of Future Research**

This study is but an initial step toward defining and exploring the effectiveness of group size on phoneme awareness instruction. Further investigations and replication studies including larger samples, control groups and classroom teachers as the instructors
would be beneficial in determining the effectiveness of phoneme awareness instruction provided to whole classes.

Longitudinal studies with long-term follow-up and larger, more diverse samples are also needed. More sensitive measures may be needed to determine which aspects of phonological awareness and reading are being affected by specific training components. In the present study, phoneme segmentation and elision scores increased while blending scores did not. This may be due to the limited amount of time spent on blending in the lessons, the fact that the measure itself is not child-friendly (e.g., use of a tape-recorded stranger’s voice), or lack of overlap between the measure and the curriculum.

Future researchers should also consider having classroom teachers implement whole class phoneme awareness instruction in kindergarten and pre-kindergarten classrooms earlier in the school year than in this present study. Yeh & Connell (2008) agree that phoneme awareness, especially instruction emphasizing phoneme segmentation, should be provided to children as young as four years old to promote phoneme segmentation skill and future reading ability. If phoneme awareness can be taught successfully even earlier, the potential benefit may lead to superior reading skill at an earlier age.

The effects of phoneme awareness on English Language Learners (ELLs) are other area of interest for researchers. Specifically, knowing more about the best ways to instruct ELLs in order to increase their phoneme awareness in the general education classroom may be of benefit to all students. Based on current research (McMaster, Kung, Han, & Cao, 2008), phoneme awareness instruction for ELL students can be successful. As the number of children learning English as another language increases, studying how
phoneme awareness develops in the first language and transfers to the second language is of particular interest (Dodd et al., 2008; Kim, 2009; McMaster et al., 2008; Pollard-Durodola & Simmons, 2009). In this present study, data from ELL students were not included in the comparison of whole class phoneme awareness instruction and small group phoneme awareness instruction. However, it would be interesting to investigate how ELLs in a general education classroom respond to both small group and whole class phoneme awareness instruction.

Finally, more effort needs to be placed on techniques for disseminating research findings to classroom teachers. It has been stated that it often takes decades for research findings to find their way into classroom practice (Abbott, Walton & Greenwood, 2002). Even though this statement may be true, it is still disheartening to realize that many diagnosticians, speech and language pathologists, and classroom teachers, even those recently graduating with teaching degrees, have little knowledge or incorrect knowledge regarding phoneme awareness and other components of language structure (Chappell et al., 2009; Cheesman et al., 2009; McGee & Ukrainetz, 2009; Moats, 2009; Phillips et al., 2008; Podhajski, et al., 2009; Schuele & Boudreau, 2008). Obviously, research findings need to be disseminated in such a way that they will be implemented in classrooms. Researchers and teachers need to work together to bring research to practice (Greenwood & Abbott, 2001).

**Conclusion**

The present study provides no evidence to support the initial hypothesis of a significant benefit of small group instruction over whole class instruction. The present
findings do provide evidence that phoneme awareness can be effectively taught to kindergarten children in both small groups and whole classes.
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379-384.


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<table>
<thead>
<tr>
<th>Lesson Number, Part and Objectives</th>
<th>Road to the Code Small Group Lesson</th>
<th>Road to the Code Whole Class Lesson</th>
<th>Changes in objectives, activities or materials and rationale for changes.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lesson #3:</strong> Say –It and Move-It: Students will move disks demonstrating single or double phonemes.</td>
<td>Single, double, and two-phoneme words: 2 disks, review of game procedure, practice /o/, /s/, /i/^/i/, /a/, /p/^/p/, /t/.</td>
<td>Single, double, and two-phoneme words: 2 disks, review of game procedure, practice /o/, /s/, /i/^/i/, /a/, /p/^/p/, /t/.</td>
<td>Materials enlarged. Practice items may be repeated to allow more children to practice in front of the group with the supersized disks.</td>
</tr>
<tr>
<td><strong>Lesson #3:</strong> Letter Name and Sound Instruction: Students will review the letter, sound, and key words associated to the letter a while coloring a picture.</td>
<td>Alphabet Books: students color a large picture of an a, apple, and ant. Teacher discusses and asks questions about the letter and sound.</td>
<td>Letter a Formation: Students review letter a, and practice forming the letter on the carpet.</td>
<td>The coloring page is eliminated. Students practice forming the letter with their fingers on the carpet they are sitting on for a kinesthetic activity.</td>
</tr>
<tr>
<td></td>
<td>Review a Story and Words: A Story and Words: Then read/tell the story about an apple and an ant. Students say sound and make motions when the letter a is mentioned. Students hold up individual cards with the letter a when that word is read during the story.</td>
<td></td>
<td>Story is added. To keep students involved and interacting with the story, students are given individual cards with the letter a printed on it which they hold up in the air every time a word is read from the story beginning with an a.</td>
</tr>
<tr>
<td></td>
<td>Pass the Sound: Students pass a ball around in a circle. When a student holds the ball, he/she says a</td>
<td></td>
<td>Pass the Sound game has been created and added to the lesson to add an element of movement, motivation and to review words beginning with /a/.</td>
</tr>
</tbody>
</table>
| **Lesson #3:**  
**Phonologic\ _al\  
Awareness Practice:** |  
recognize and indicate which words sound the same at the end (are rhyming or not rhyming). |  
**word that begins with /a/:** |  
**Sound Categorization by Rhyme:** |  
Teacher sings song, students pick out different word based on not rhyming (show 4 cards, say words, students pick out the one word that sounds different / doesn’t rhyme). Repeat with 3-5 sets of 4-cards. |  
**Sound Categorization by Rhyme:** |  
Teacher sings song, students pick out different word based on not rhyming (show 4 cards, say words, students pick out the one word that sounds different / doesn’t rhyme). Repeat with 3-5 sets of 4-cards. |  
To give more students a chance to participate, the cards are given to 4 students at a time who hold the cards in front of the rest of the group and say the name of the picture. Another student chooses 2 words that sound the same (rhyme), the students with those cards sit down, and 2 more students come up and take 2 more cards (the card that did not rhyme with the others will rhyme with one of the new words). This continues until everyone has had a turn in front of the group or the time is up. |

*Figure A1.* Comparison of lesson #3 for small group and whole class instruction based on *Road to the Code* by Blachman, Ball, Black, & Tangel (2000).
<table>
<thead>
<tr>
<th>Lesson Number, Part and Objectives</th>
<th>Road to the Code Small Group Lessons</th>
<th>Road to the Code Whole Class Lessons</th>
<th>Changes in objectives, activities or materials and rationale for changes.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lesson #22:</strong> Say –It and Move-It: Students will move disks demonstrating single or double phonemes, 2 or 3 phoneme words. Students will move a letter tile at the appropriate place in the given words.</td>
<td><strong>Single, double, and two-or three-phoneme words:</strong> 3 disks + 1 disk with letter m on it. Students use 2 individual response cards (one with an m on it and the other with 2 and 3 disks on it). Students in the audience hold up the appropriate cards to designate the number of disks and whether or not the letter is used while the guest mover moves the disks in front of the class. Discuss the letter tile, model and then students practice -- some phonemes are combined to make words: /m/, rim, am, mad, map, Sam, mop.</td>
<td>Materials enlarged -- using supersized board and disks. Practice items may be repeated or added to give additional students a chance to move the disks in front of the group. 3- or 4-phoneme combinations are added to this lesson. All students hold up response cards to increase participation and interaction during this part of the lesson.</td>
<td></td>
</tr>
<tr>
<td><strong>Lesson #22:</strong> Letter Name and Sound Instruction: Students identify and match letters or sounds of letters a, m, t, i, s</td>
<td><strong>Go Fish:</strong> Using small letter cards of a, m, t, i, s students play classic game of “Go Fish”, trying to get pairs of letters.</td>
<td><strong>Sound Toss:</strong> Teacher will say a word, each student with a beanbag (one from each team) decides which sound/letter it begins with and tosses it (or places it) onto the square with the appropriate letter (if he/she is unsure, his/her teammates may be asked for help). The team who gets their beanbag on the correct square, earns a point for their team.</td>
<td>This game requires the students to decide on the initial sound and pair it with the letter by physically tossing or placing a beanbag on a letter. Since the students are grouped into teams, they do not have a long wait in between turns.</td>
</tr>
<tr>
<td><strong>Lesson #22:</strong> Phonological Awareness</td>
<td><strong>Elkonin Cards:</strong> Using printed Elkonin Cards</td>
<td><strong>Walking Elkonin Cards:</strong> Students are used as human chips or disks and</td>
<td>The concept is the same, however instead of each child moving</td>
</tr>
</tbody>
</table>
**Practice:** Students will say the picture name, move 1 disk as each phoneme is said into the printed boxes left to right. Students blend the phonemes into the words. Students tell which disk represents which sound.

(Elkonin, 1973), students say word and move disks to match phonemes for each picture represented on card: fat, jam, sit, web, ram.

Moved by other children into the appropriate places/squares on the floor to blend a given word: fat, jam, sit, web, ram.

Individual disks on individual picture cards, students act as the disks and say the sound as they are being moved into squares on the floor.

---

*Figure A2.* Comparison of lesson #22 for small group and whole class instruction based on *Road to the Code* by Blachman, Ball, Black, & Tangel (2000).
<table>
<thead>
<tr>
<th>Lesson Number, Part and Objectives</th>
<th>Road to the Code Small Group Lessons</th>
<th>Road to the Code Whole Class Lessons</th>
<th>Changes in objectives, activities or materials and rationale for changes.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lesson #40:</strong> Say –It and Move–It:</td>
<td>Single, double, and two- or three-phoneme words: 4 disks + 1 disk with letter f on it. Review the letter tile, model and then students practice -- some phonemes are combined to make words: fit, run, if, ten, is, fun, fib.</td>
<td>Single, double, and two- or three-phoneme words: 4 disks + 1 disk with letter f on it and 1 disk with the letter t on it. Discuss the letter tile, model and then students practice -- some phonemes are combined to make words: fit, run, if, ten, is, fun, fib, fat.</td>
<td>Materials enlarged -- using supersized board and disks. Practice items may be repeated or added to to give additional students a chance to move the disks in front of the group. 3- or 4-phoneme combinations are added to this lesson.</td>
</tr>
<tr>
<td><strong>Letter Name and Sound Instruction</strong></td>
<td>Individual SIAMI trays: Individual magnetic SIAMI trays and magnets and the procedure to use them are introduced to the class, and students practice with the phonemes from the Supersized lesson on their individual magnetic trays and magnets for disks.</td>
<td>Individual metal trays and magnets as disks, (similar to the original mats in the Road to the Code manual) are used by each student to promote individual practice and accountability.</td>
<td></td>
</tr>
<tr>
<td>lesson #40: Using individual sound boards and letters, students are introduced to the sound board and the procedure for using it. The teacher instructs the students to find the letter asked for and move it to the bottom pocket. Letters: i, t, s, b, f. Make words: /i/, it, fit, fib, sit, bit, it, if, /i/, fib.</td>
<td>Sound Boards: Using a supersized sound board (pocket chart and letter cards), students are introduced to the sound board and the procedure for using it. The teacher instructs the students to find the letter asked for and move it to the bottom pocket. Letters: i, t, s, b, f. Make words: /i/, it, fit, fib, sit, bit, it, if, /i/, fib.</td>
<td>Materials are enlarged to be used in front of the large group of students. Words are either repeated or added to give more students opportunities to practice.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lesson #40: Phonological Awareness Practice: Students will isolate and identify the initial sound of pictures that begin with a, m, t, i, s, r, b, f then match the sound to the letter.</td>
<td>Post Office: Students take turns wearing a mailbag, picking out several pieces of “mail”, identifying the picture, telling the initial sound, and matching it to the correct letter bag. Pictures beginning with a, m, t, i, s, r, b, f are used.</td>
<td>Sound Farm: When told to (after everyone has a letter), the students begin making the sound of their letter to find the rest of the people with the same letter, (so there will be a group of students all making the same sound, then they show each other the letter card they have hidden, to be sure they are in the right group.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>tell sounds for letters.</td>
<td>/i/, it, fit, sit, if,</td>
<td>/i/</td>
<td></td>
</tr>
</tbody>
</table>

*Figure A3. Comparison of lesson #40 for small group and whole class instruction based on Road to the Code by Blachman, Ball, Black, & Tangel (2000).*
Appendix B

*Between-Groups t-tests at Pre- and Posttest*

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th></th>
<th></th>
<th>Posttest</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t$ (64)</td>
<td>$p$</td>
<td></td>
<td>$t$ (64)</td>
<td>$p$</td>
</tr>
<tr>
<td><strong>Phoneme Awareness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSEG</td>
<td>0.31</td>
<td>0.76</td>
<td></td>
<td>0.27</td>
<td>0.79</td>
</tr>
<tr>
<td>CTOPP-blending</td>
<td>0.95</td>
<td>0.35</td>
<td></td>
<td>0.50</td>
<td>0.62</td>
</tr>
<tr>
<td>CTOPP-elision</td>
<td>0.60</td>
<td>0.55</td>
<td></td>
<td>0.38</td>
<td>0.71</td>
</tr>
<tr>
<td><strong>Letter Knowledge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LN</td>
<td>0.28</td>
<td>0.78</td>
<td></td>
<td>1.11</td>
<td>0.27</td>
</tr>
<tr>
<td>LNC</td>
<td>0.29</td>
<td>0.78</td>
<td></td>
<td>1.02</td>
<td>0.31</td>
</tr>
<tr>
<td>LNV</td>
<td>0.21</td>
<td>0.84</td>
<td></td>
<td>0.65</td>
<td>0.52</td>
</tr>
<tr>
<td>LS</td>
<td>0.55</td>
<td>0.59</td>
<td></td>
<td>0.86</td>
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</tr>
<tr>
<td>LSC</td>
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<td>0.63</td>
<td></td>
<td>1.37</td>
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<tr>
<td>LSV</td>
<td>0.74</td>
<td>0.46</td>
<td></td>
<td>1.51</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>Word Identification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRMT-R</td>
<td>1.06</td>
<td>0.29</td>
<td></td>
<td>1.28</td>
<td>0.20</td>
</tr>
</tbody>
</table>

*Note.* PSEG = Phoneme Segmentation Test; CTOPP-blending = Comprehensive Test of Phonological Processing – Blending subtest; CTOPP-elision = Comprehensive Test of Phonological Processing – Elision subtest; LN = Letter name knowledge; LNC = letter
name consonant test; LNV = letter name vowel test; LS = Letter sound knowledge; LSC = letter sound consonant test; LSV = letter sound vowel test; WRMT-R = Woodcock Reading Mastery Test – Revised.
Appendix C

*Main Effect of Time, Main Effect of Group, and Time x Group Interaction*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Group</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F$ $p$</td>
<td>$F$ $p$</td>
<td>$F$ $p$</td>
</tr>
<tr>
<td>Phoneme Awareness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSEG</td>
<td>107.9 0.0001</td>
<td>0.11 0.74</td>
<td>0.01 0.93</td>
</tr>
<tr>
<td>CTOPP-blending</td>
<td>0.10 0.75</td>
<td>0.15 0.70</td>
<td>2.05 0.15</td>
</tr>
<tr>
<td>CTOPP-elision</td>
<td>24.31 0.0001</td>
<td>0.27 0.60</td>
<td>0.06 0.81</td>
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<tr>
<td>Letter Knowledge</td>
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<td></td>
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<tr>
<td>LN</td>
<td>32.77 0.0001</td>
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</tr>
<tr>
<td>LNC</td>
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<td>LNV</td>
<td>7.309 0.009</td>
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<td>1.75 0.19</td>
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<td>LS</td>
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<td>LSC</td>
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<tr>
<td>LSV</td>
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<tr>
<td>WRMT-R</td>
<td>15.06 0.0001</td>
<td>1.75 0.19</td>
<td>0.64 0.43</td>
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</table>
Note. PSEG = Phoneme Segmentation Test; CTOPP-blending = Comprehensive Test of Phonological Processing – Blending subtest; CTOPP-elision = Comprehensive Test of Phonological Processing – Elision subtest; LN = Letter name knowledge; LNC = letter name consonant test; LNV = letter name vowel test; LS = Letter sound knowledge; LSC = letter sound consonant test; LSV = letter sound vowel test; WRMT-R = Woodcock Reading Mastery Test – Revised.
VITA

NAME OF AUTHOR: Angelique Fleurette VanBoden

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

   LeMoyne College, Syracuse, New York
   State University of New York at Cortland College, Cortland, New York

DEGREES AWARDED:

   Master of Science in Reading Education, 1998, State University of New York at Cortland College
   Bachelor of Science in Psychology, 1995, LeMoyne College
   NYS Teaching Certification, Special Education (birth – 21), 1995
   NYS Teaching Certification, Elementary Education (K – 6), 1995
   NYS Teaching Certification, Reading Education (K-12), 1998

AWARDS AND HONORS:

   Future Professoriate Certificate of University Teaching, 2000
   Graduate Teaching Assistantship with Tuition Scholarship, 1999 – 2002

PROFESSIONAL EXPERIENCE:

   Visiting Professor, State University of New York at Cortland College, 2008-2009
   Adjunct Faculty, Empire State College, 2009-2010
   Teaching Assistant, Department of Reading and Language Arts, Syracuse University, 1999-2002