EFFECTS OF PHONOLOGICAL AWARENESS INSTRUCTION ON PRE-READING SKILLS OF PRESCHOOL CHILDREN AT-RISK FOR READING DISABILITIES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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ABSTRACT

The study investigated whether phonological awareness instruction based on *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994), was effective in improving the phoneme-blending, phoneme-segmentation, and word reading skills of preschool children at-risk for reading disabilities. Three preschool children at-risk for reading disabilities participated in this study and were pulled out during classroom free play time. They received fifteen minutes of instruction five days a week. A native English speaker served as the interventionist and implemented the instruction on one-on-one basis. Multiple probes across subjects design was used to analyze the effects of the instruction on phoneme segmentation fluency (PSF) and nonsense word fluency (NWF) of the participants as measured by Dynamic Indicators of Basic Literacy Skills (DIBELS). Pretest and posttest measures and daily Curriculum-Base Instruction (CBM) also provided data for student progress.
Results of DIBELS indicated that phonological awareness instruction was effective to improve PSF for all participants. Although phonological awareness instruction did not show functional relation with NWF because one participant failed to show improvement, two participants did make progress. Pretest and posttest measures as well as CBM also have implications on student progress. Limitations of the study and directions for future research are discussed.
Dedicated to my grandaunt
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CHAPTER 1

INTRODUCTION

Reading problems are often the major concern in educating students because reading is the prerequisite skill for success in all other academic areas. Lerner (2003) further emphasized the importance of reading by saying “children must learn to read so that later they can read to learn (p.396)”. Adams (1990) indicated that reading is a reliable predictor for children to succeed in school and become productive members of society. For example, the ability to read the text is critical for daily life, such as reading medical information, work-related reading materials, newspaper, filling out various applications, understanding the written information to use high-technological instruments, etc. People without the ability to read quickly, effortlessly, and automatically are ill-equipped to function well in today’s society.

However, according to Putman (2005), reading is the most fundamental but difficult skill for children to learn. Nowadays, the number of students who have reading difficulties in the United States is alarming. Study indicated that more than 70% poor readers have difficulties in phonological awareness when they are in kindergarten (Catts, Fey, Zhang,
McDonald and Cornwell (1995) reported that the phonological awareness scores in kindergarten were highly related to the performance in word identification and spelling 11 years later. 88% of children with reading deficits in the first grade will continue to experience reading problems at the end of the fourth grade (Juel, 1988). The majority of fourth graders with poor reading performance continued to experience difficulty in decoding monosyllabic nonsense words. Also, lack of appropriate reading instruction and early reading interventions may deteriorate the gap between low-achieving children and typically developing children, and this concern may deteriorate the minority overrepresentation in special education (Reschly, 2002). High-stakes testing has only amplified the urgency for educators to address the challenge to prepare children to become successful readers with sufficient pre-literacy skills.

During the past 30 years, there has been a dramatic rise in efforts to prevent reading failure, especially for young children (Smith, 2004). One of the fundamental blocks for building reading success is the difficulty in phonological awareness (Adams, 1990; Wagner & Torgesen, 1987).

In the recent National Reading Panel Report, phonological awareness was regarded as the most important component to beginning reading (National Institute of Child Health and Human Development, 2000). The researchers identified poor
phonological awareness as one of the possible causes for reading failure. Phonemic awareness, as a part of phonological awareness, indicates the ability to recognize and manipulate “phonemes” in spoken words. The sound-letter correspondence emphasized by phonemic awareness serves as the foundation for future reading development, particularly in alphabetic systems (McCardle & Chhabra, 2004; Snow, Burns, & Griffith, 1998).

*Rationale for Teaching Phonological Awareness*

Over the past two decades, research with the emphasis on phonological awareness has received a great deal of attention. Since the 1980s, researchers have identified problems in phonological processing are a major factor for reading difficulties. In addition, numerous studies have demonstrated that understanding of phonological awareness is a strong predictor of later reading success (Catts, et al., 2001). In the longitudinal study Catts and his colleagues tracked reading achievement of 604 young children and reported more than 70% of poor readers had a history of deficits in phonological awareness or oral language in kindergarten.

During the 1990s, research demonstrating the crucial role of phonological awareness on reading grew rapidly and numerous studies were conducted (Clark & Uhry, 1995). Adams (1990) indicated that phonological awareness brought children the concept
that words could be split into individual sounds (phonemes) and mapped onto symbols, which would directly facilitate to more accurate and rapid word recognition. Bender (2001) addressed that learning disabilities might emerge at a very young age and people with learning disabilities might have deficits in manipulating individual phonemes. Based on the findings of the empirical studies, researchers were in agreement that deficits in phonological awareness were a reliable predictor to reading difficulties (Catts et al., 2001; Torgesen, Wagner, & Rashotte, 1994; Torgesen & Davis, 1996).

In addition, phonological awareness instruction has demonstrated effectiveness in accelerating reading growth (Bowey & Francis, 1991; Lyon, Shaywitz, & Shaywitz, 2003). To use the alphabetic system fluently, it is better for people to be familiar with the correspondence between graphic representations (letter or letter groupings) and their specific phonemes (Harris & Hodges, 1995). The awareness of the internal phonological structure of words needs instruction (Liberman, Shankweiler, & Liberman, 1989). Only if children learn the alphabetic principle could they distinguish the word cat and the word mat by their initial phonemes and know some letter groupings only represent one phoneme such as the phoneme of oa in boat is /o/. Thus, researchers also addressed that the sensitivity to language units could be enhanced by phonological awareness instruction plus the grapheme-phoneme (letter-sound) correspondence training (Byrne &
Fielding-Barnsley, 1989). Bowey and Francis (1991) found that kindergarten children who were nonreaders did not have phonological awareness skills. Only after receiving explicit instruction were they capable of skills in intrasyllabic (onset-rime) level, which also confirmed the feasibility to implement phonological awareness instruction since young age.

High technology also confirms the relationship between phonological awareness and reading growth. Functional magnetic resonance imaging (fMRI) reveals that during phonological awareness tasks the brains of children with dyslexia show less activation in Broca’s area which is in charge of language than those of typically developing children. The study of Lyon and his colleagues (2003) showed that during phonological awareness instruction, children made significant gains in reading fluency and demonstrated increased activation in left hemisphere brain regions through functional magnetic resonance imaging. The implication for research is that early reading intervention does have positive impact on reading and should be implemented as early as possible to prevent phonological deficits and later reading difficulties.

Phonological Awareness Instruction

Recently, materials for addressing the beginning reading needs of a wide range of students have proliferated. For example, *Ladders to Literacy* (O’Connor,
Notari-Syverson, & Vadasy, 1998), *Phonemic Awareness in Young Children* (Adams, Foorman, Lundberg, & Beeler, 1998), and *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994) were commonly used phonological awareness training programs. Their effectiveness has been demonstrated by previous studies, but whether or not these skills would generalize is one concern of some researchers. Besides, studies targeting on phonological awareness instruction on young children need to be extended. Due to the critical role of phonological awareness in early literacy skills and the scarcity of the empirical studies, this study aims at examining the effects of one commercially developed phonological awareness program, *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994), on phoneme blending, phoneme segmentation, and words reading of preschool children.

Two empirical studies have been conducted using this phonological awareness training program. Torgesen, Morgan, and Davis (1992) investigated if training in both analytic (segmenting) and synthetic (blending) phonological skills was necessary for reading development. The children who scored between the 15th and 50th percentiles on a phonological awareness test participated in the study, being divided into three groups: one received explicit instruction on both analytic and synthetic phonological tasks, another received synthetic skills only, and the language-experience control group
received no phonological awareness training. The training was done in small groups of three to five children for 20 minute per day, three times a week for a period of 7 or 8 weeks. Results showed children receiving instruction on two types of phonological tasks or synthetic skills scored higher in blending test compared to the control group. In addition, only when both skills were trained did children significantly improve in segmenting and generalize the learned phonological awareness skills to read new words. There were two implications: first, training in both phonological skills prepared children more ready to reading. Second, the instructional sequence in this study was phoneme segmentation skills followed by phoneme blending skill. However, it seemed that blending tasks were much easier for children, so the researchers altered the order of the skills trained to present the easier tasks (phoneme blending) first.

The second study was conducted by Torgesen and Davis (1996) using the revised instructional sequence based on the conclusion of the first study. Phoneme blending, which was regarded as easier skills for children, was taught before phoneme segmenting skills. 60 children participated in the study at the beginning of the second semester of kindergarten. They were divided into two groups, training group and control group, composed of 3 to 4 children for each. The training group was composed of approximately 70% minority children who were also identified as at-risk for reading
failure due to poor phonological skills. Instruction for the training group was delivered in small groups for 20 minutes per day, 4 days a week. The only difference between training group and control group was children in the training group received phonological awareness training using the current program. After 10 weeks of training, the training group significantly outperformed the control group in both analytic (segmenting) and synthetic (blending) phonological awareness tasks, and the effects were maintained until the beginning of first grade. Again, the effects of phonological awareness instruction were demonstrated and the results also indicated phonological awareness skills was teachable for kindergarteners.

Purpose of the Study

Reading is important for academic and daily life success, and phonological awareness is a key to developing children’s reading skills (National Reading Panel, 2000). The primary goal of the current study is to evaluate whether phonological awareness instruction could successfully improve skills in phoneme blending, phoneme segmentation, and word reading. The literature abounds with research on the relationship of phonological awareness and early literacy skills for kindergarteners and first graders, but lacks empirical studies for younger children, especially for preschoolers. Hence, this
study replicated and extended previous research using this training program in several ways.

First, phoneme blending skills are taught before phoneme segmenting skills. Second, maintenance is examined by assessing if the participants are able to correctly read words learned during intervention after instruction has ended. Third, generalization is examined by assessing if the participants are able to read nonsense words composed with previously learned letter sounds. Fourth, the participants are extended to preschool children to determine if the effects of phonological awareness instruction could be demonstrated early at age 5, which is in accordance with the needs for early prevention. Fifth, data regarding how consumers of the study view the effectiveness of this instruction and how it influences their daily life are collected.

Research Question

1. What are the effects of phonological awareness instruction (i.e., Phonological Awareness Training for Reading) on phoneme-segmentation skill of preschool children at-risk for reading disabilities?

2. What are the effects of phonological awareness instruction (i.e., Phonological Awareness Training for Reading) on nonsense word reading skill of preschool children at-risk for reading disabilities?
3. What are the effects of phonological awareness instruction (i.e., *Phonological Awareness Training for Reading*) on phoneme-blending skill of preschool children at-risk for reading disabilities?

4. Will the participants be able to correctly read words learned during intervention after the instruction has ended?

5. Will the participants be able to correctly read untrained words composed of learned letter sounds at the completion of the study?

6. What are the opinions of the classroom teacher about the effectiveness of phonological awareness instruction (i.e., *Phonological Awareness Training for Reading*)?

7. What are the opinions of participants and their parents about the effectiveness of phonological awareness instruction (i.e., *Phonological Awareness Training for Reading*)?
CHAPTER 2

LITERATURE REVIEW

Student At-Risk for Reading Disabilities

The failure of children to develop early reading skills that contribute to academic and social success has turned out to be a national concern. Poor reading skills result in lower overall academic achievement. Multiple and complex factors contribute to poor reading outcomes in urban schools; for example, minority children and children who come from impoverished families (Snow, et al., 1998). Reading deficits are disproportionately high among poor minority children which may attribute to overrepresentation of minority groups in educational placement of special education (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990). Males are also likely to be overrepresented due to their maladaptive behaviors; on the other, their female counterparts are frequently underrepresented in teacher’s referrals of reading disabilities (Shaywitz, et al., 1990). In order to prevent reading difficulties, the top priority is early identification and reading intervention to address this problem.
Overrepresentation in Special Education

The problem of overrepresentation of minority children in the U.S. special education programs is serious and complex. The issue of overrepresentation of minority students in special education in the United States has raised a concern among special education researchers and the policy makers such as the Office of Civil Rights and the National Center for Education Statistics. There is strong evidence that higher proportions of Native American, African American, and Hispanic students are identified with high-incidence disabilities (i.e., learning disabilities, mental retardation) when compared to Caucasian students (Artiles & Trent, 1994).

Traditional screening methods used by the public schools system to identify students with disabilities appear to be confusing, inconsistent, and highly dependent on information directly provided by teachers. The procedures used by teachers for referring students to special education settings vary from school to school and do not follow standardized procedures or tests. (U.S. Department of Education, 2002). Moreover, there is evidence that teachers are biased in their referring procedures (Shinn, 1987). Studies indicated males and students with behaviors problems are overrepresented, while females were primarily underrepresented in teachers’ referrals of reading difficulties (Shaywitz, Shaywitz, Fletcher, & Escobar, 1990).
The problem is magnified when reading scores are taken into consideration. Studies showed that lack of appropriate reading instruction and early reading interventions among low-achieving minority children is contributing to the overrepresentation of these children in the high-incidence disability categories of mild mental retardation, emotional disturbances, and specific learning disabilities. National Association of Educational Progress data over the past 30 years document a pattern of fluctuating but persistent reading achievement gap between Caucasian students and African American, Hispanic, and Native American students. To illustrate, the average reading scores of Caucasian students are higher than those of African students at ages 9, 13, and 17. Recent studies conducted by the National Center for Education Statistics (NCES) documented large gaps in student achievement on school tests as early as preschool. For example, 73% of white preschoolers were proficient in letter recognition, but only 59% of African American and 49% of Hispanic preschoolers were proficient. There were similar differences among races for recognition of words’ beginning and ending sounds and for print familiarity-skills typically identified as important for success in school (NCES, 2002).

A large body of descriptive and correlational studies indicated that reading difficulty may play a role in special education referral and placement decisions. Data
show, for instance, that 80% of the children referred for specific learning disabilities (SLD) are due to reading problems (Snow, Burns, & Griffin, 1998). This is a substantial number of children because SLD accounts for approximately 50% of all children placed in special education (U.S. Department of Education, 2001). There is also research linking behavior problems and reading deficits (Trout, Nordness, Pierce, & Epstien, 2003). Academic failure that results from reading difficulties is often a contributing factor in children’s misbehavior in school (Losen & Orfield, 2002). Reading difficulty may also trigger concerns about learning and result in placements of mental retardation. Therefore, it is to consider early reading difficulty as a factor in special education referrals.

*The Need for Early Reading Intervention*

To solve the overrepresentation in special education, the priority to be addressed is the quality of classroom instruction and the need for early identification and reading intervention. Inadequate instruction (i.e., classroom instruction that is not guided by systematic assessment or adapted to meet individual needs) is a plausible explanation for children’s low achievement. The quality of the teaching force assigned to high-poverty schools (e.g., having high numbers of inexperienced, substitute, and noncertified teachers and employing paraprofessionals), the relatively limited availability of reading material
and other resources, and the physical condition of schools are factors which significantly lower the students’ performance (Best, Coutinho, & Oswald, 2002). Thus, the lack of high quality instruction in reading, if combined with these other factors, may constitute the reading failure that in return prompts the referral of many students to special education programs.

Reading difficulty is one of the most common reasons for referral to special education settings (Mastropieri, Lenhart, & Scruggs, 1999). That the number of student without adequate literacy skills to enjoy reading and successfully comprehend grade-level texts is beyond expected of school staff. Researchers addressed that reading patterns are established early and, once established, it is difficult to remedy (Good, Simmons, & Kame’enui, 2001; Torgesen & Burgess, 1998). Based on this data, it is clear that there is a need for early intervention. School districts are granted additional assistance for their students through a provision in the U.S. Individuals with Disabilities Education Act (IDEA) allowing districts to use up to 15 percent of their federal special education funding for “early-intervening services”. These services aimed at preventing reading disabilities rather than relegating students immediately to special education.

Children with reading/learning disabilities confronted with enormous challenges in learning to read. Many never reach the level of reading proficiency that allows them to
function in school. Since the needs for early reading intervention, the first step is to identify and prevent at-risk children to reducing the incidence or severity of reading disabilities. As school district staff tend not to identify these children until the middle elementary grades, their early reading difficulties are unnoticed and intervention needs unmet. To gain the most effective outcome of intervention, schools are recommended to take measures identifying these children much earlier than usual (Schwartz, 2005).

**Key Concepts of Early Literacy Acquisition**

There is a consensus that early literacy acquisition is the right of all children and the key to success in their future learning. Many children are deprived of the right to literacy and subsequently struggle in school and throughout adult life (Levy & Vaugh, 2002). Early literacy acquisition is the likely antidote to addressing school problems enabling children to gain power from success. In recent years many concerned bodies and associations have developed programs for children literacy. These programs share with some common elements which are beneficial to reading development. The key to successful programs lies mainly in their components and the way they are delivered. In terms of program components, Good and Kaminski (2002) acknowledged the 5 big ideas for beginning readers, involving phonemic awareness, alphabetic principle, text fluency,
adequate vocabulary and reading comprehension. The main reason is that training in these program components differentiates good readers from poor readers.

*The Big Ideas of Early Literacy*

Acquisition of reading takes a variety of early language and literacy skills. Researchers, parents, and teachers have suggested that language and environment is a likely source of experiences that can enhance the development of oral language and early-literacy skills. There are 5 big ideas in beginning reading, involving phonemic awareness, alphabetic principle, fluency with text, vocabulary, and comprehension (Good & Kaminski, 2002).

*Phonemic awareness.* Phonemic awareness referred to the ability to hear and manipulate the sounds in spoken words and the understanding that spoken words and syllables are made up of meaningful sequences of speech sounds. It is essential to learning to read in an alphabetic writing system, because letters represent sounds or phonemes (Ball & Blachman, 1991; Bradley & Bryant, 1983; Lundberg, Frost, & Perterson, 1988). Therefore, without phonemic awareness, phonics makes little sense. Besides, it is fundamental to mapping speech to print. If a child cannot hear that “*man*” and “*moon*” start with the same sound or cannot blend the sounds /r/-/u/-/n/ into the word “*run*”, he or she may have difficulty connecting sounds with their written symbols or
blending sounds to make a word. Thus, the best predictor of reading difficulty in kindergarten or first grade is the inability to take words and syllables apart and into constituent sound units (phonemic awareness) (Lyon, 1995).

Phonemic awareness is difficult but important. It is difficult because, although there are only 26 letters in the English language, sounds represented by letters and letter strings could be shown in 250 different spellings. Phonemic awareness is important because it gives readers a way to approach sounding out and reading new words, lending readers a hand to understanding the alphabetic principle (that the letters in words are systematically represented by sounds).

Phonemic awareness is learned through language experiences and for some children that required systematic explicit instruction. As phonemic awareness is a critical component of reading instruction but not an entire reading program, it absolutely needs to be taught, but should only take 10-15 minutes per day. Research has found that students get better results when teaching phonemic awareness to small groups rather than an entire class. Furthermore, it needs to be taught explicitly to show children what they expect to do. More important, teachers must model skills they expect children to perform before they are asked to demonstrate the skill (Manning, 2005).
Alphabetic principle. The alphabetic principle is composed of two parts: alphabetic understanding and phonological recoding. The alphabetic understanding referred to awareness that words are composed of letters that represent sounds. The phonological recoding focuses on using systematic relationships between letters and phonemes (letter-sound correspondence) to retrieve the pronunciation of an unknown printed word or to spell words. More specifically, the phonological recoding consists of regular word reading, irregular word reading, and advanced word analysis. Studies indicated that curricular choice and incorporation of phonemic awareness into the kindergarten curriculum affects growth in kindergarten alphabetic principle understanding, literacy skills and first-grade reading and spelling outcomes (Foorman, et al., 2003). With respect to assessment, alphabetic principle skills can be assessed using standardized measures. Measures of nonsense word reading provides a measure that can be used to assess students’ understanding of the alphabetic principle to apply learned letter-sound correspondences and recoding skills to read words.

Fluency. Individuals who are able to read the text with fluency could read words effortless in connected text, and it in turns enables them to allocate their attention to the comprehension and meaning of the text (Juel, 1991). The term “automaticity” is frequently used when fluency is mentioned. Automaticity is defined as the ability to
translate letters-to-sounds-to-words fast and accurately. If a child could read words with no noticeable cognitive or mental effort, he or she may recognize word very fast without much consciousness. Hasbrouck (1998) reported that several features of a successful reader. For example, a good reader relies primarily on the letters in the word to identify familiar and unfamiliar words, processes virtually every letter, uses letter-sound correspondences to identify words, and has a reliable strategy for decoding words. Hence, the access of sufficient time and number of words would help the reading level attain automaticity (fluency). In these perspectives, a proficient reader needs to have some prerequisite skills in hierarchical order, including letter knowledge, phonological awareness, decoding, and vocabulary, which focus their attention on constructing meaning from the print (Kuhn & Stahl, 2000). It is better to reach the attainment of the basic skills to develop fluency for future understanding.

**Vocabulary.** Vocabulary referred to the ability to understand receptive words and use expressive words to acquire and convey meaning. As a learner begins to read, reading vocabulary is mapped onto the oral vocabulary the learner brings to the task. Learning, as a language-based activity, is fundamentally and profoundly dependent on vocabulary knowledge. Learners must have access to the meanings of words that teachers use to guide them into already known concepts in novel ways (Baker, Simmons, &
In terms of teaching vocabulary, it involves mainly (a) critical features of vocabulary instruction, (b) types of vocabulary instruction, (c) critical vocabulary skills to be learned, (d) sequencing vocabulary skills, (e) teaching vocabulary using storybooks, (f) vocabulary benchmarks and (g) vocabulary programs and materials.  

*Comprehension.* Comprehension is the immediate goal of reading. Successful reading comprehension calls for the ability to read vocabulary, the ability to comprehend speech, and the ability to access background knowledge. If learners lack any one of the abilities above, reading comprehension is compromised. Studies further showed that readers taught cognitive strategies make significant gains on measure of reading comprehension. In this line of thinking, teaching decoding and word recognition strategies is bound to enhance comprehension. Comprehension failure, on the contrary, is attributable to such causes as inadequate instruction, insufficient exposure and practice, deficient word recognition skills, deficient memory capacity and functioning, significant language deficiencies, inadequate comprehension monitoring and self-evaluation, unfamiliarity with text features and task demands, undeveloped attentional strategies, and inadequate cognitive development and reading experiences (Kame’enui & Simmons, 1990). When it comes to teaching, research further suggests that students be taught explicitly to listening and reading comprehension strategies.
**Key Differences between Good and Poor Readers**

There are a variety of traits that differentiate good readers from poor readers. For one thing, good readers contrast with their poor partners in the way they read. To illustrate, when they come to an unfamiliar word, good readers use many different strategies for word analysis, while poor readers sound it out. If sounding it out fails, poor readers have no alternatives (Cullinan, 2007). Good readers are likely to outperform their poor partners in all the reading skills, phonological awareness in particular.

The importance of phonological awareness in developing reading skills has been proved by many researchers (Ball & Blachman, 1991; Bradley & Bryant, 1983; Lundberg et al., 1988). As a matter of fact, it is a predictor of whether a child will become a good reader or not. In the 1980s, British researchers Lynette Bradley and Peter Bryant found that “a preschoo ler’s phonological aptitude predicts his reading three years later “(Macmillan 1997, p. 55). In the 1990s, Shaywitz and other research groups found that “phonological difficulties are the most significant and consistent markers of dyslexia in childhood” (2003, p.55). Thus, it is important for readers to have phonological awareness for reading and spelling. In an examination of phonological awareness treatment outcomes for seventh-grade poor readers from a bilingual community, Swanson, Hodson, and Schommer-Aikins (2005) found that poor readers can benefit from instruction
sessions focusing on phonological awareness improving their post-treatment scores higher for all measures, including phonological awareness, word attack, word identification, word comprehension, and passage comprehension.

In recent years researchers have made efforts in understanding the casual basis of reading disabilities (Torgesen et al., 1994, Wolf & Bowers, 1999). One feature of children with reading disabilities or dyslexia was the discrepancy between their reading performance and other cognitive abilities (Stanovich, 1988). Deficits in phonological awareness and related phonological processing have been found to be responsible to many children with reading disabilities although their other cognitive abilities were above average (Catts, 1996; Wolf & Bowers, 1999). Difficulty in connecting the letters with their represented sounds is one determinant to fluent, effortless word recognition, and in turn negatively influences reading comprehension, the ultimate goal of reading instruction (O’Shaughnessy & Swanson, 2000).

Phonological awareness is not the only deficit identified in poor readers. Still other factors potentially predict or influence reading outcomes, such as alphabet knowledge, rapid naming abilities, verbal memory, auditory discrimination, working memory, and grammatical ability (Catts, 1996; Stackhouse, Nathen, Goulardris, & Snowling, 1999). Rapid naming and letter knowledge are additional factors responsible
for poor reading achievement (Wolf, Bowers, & Biddle, 2000; Treiman, Broderick, Tincoff, & Rodriguez, 1998). The findings of Blachman (1994) showed that lack of abilities in rapid naming of colors, letters, words, and other items had a significant impact on reading skills. In this perspective, rapid letter naming was one of the variables to differentiate individuals with dyslexia from typical readers. Although poor readers may still exhibit reading growth with the passage of time, but it is hard for them to catch up to strong readers because of their negative attitudes towards reading constitute a barrier to reading fluency (Allington, 1994; Juel, 1988). Further, the amount of reading time a poor reader spends in one year is scarcely comparable to two-day reading for a good reader (Cunningham & Stanovich, 1998).

*Persistence of Phonological deficits*

Reading difficulty is the most common characteristic of children with learning disabilities. Phonological awareness seems a reliable predictor in early literacy to future reading success (Backus, 2005). A large body of research indicated that the primary problems for children’s poor performance in reading were deficits in phonological awareness (Morris et al, 1998, Stanovich, 1988). In a longitudinal study Catts and his colleagues (2001) tracked reading achievement of 604 young children and reported more than 70% of poor readers had a history of deficits in phonological awareness or oral
language in kindergarten. Even typically developing children may have one or two problems in phonological awareness skills when starting to learn to read; however, they may make sufficient progress to meet the standard criteria after instruction and practice. If the delays in phonological awareness skills are not addressed, the deficits may be life-long. Otherwise, the phonological deficits of the specific population may last through life, which would prevent children from catching up with their peers and increase the discrepancy in reading development between children with and without reading problems (Juel, 1988; MacDonald & Cornwall, 1995; Scarborough, 1998; Stuart & Masterson, 1992).

Early phonological deficits may have long-term negative effects to prevent young children from the typical reading development trajectory and contribute to difficulties in other academic areas because the content is mainly delivered by written words. Juel (1988) conducted a study on 54 children with low socioeconomic background in track of their reading and writing development from first to fourth grade. The participants’ progress in phonological awareness, decoding, word recognition, spelling, comprehension, and writing were monitored by assessments each year. He found that children identified as poor phonological awareness at the end of first grade had the high probability (.88) to be a poor readers at the end of fourth grade. The majority of fourth
graders with poor reading performance in this study continued to experience difficulty in decoding monosyllabic nonsense words.

In a longitudinal study, McDonald and Cornwell (1995) assessed word recognition, phonological awareness, and comprehension on 24 teenagers whom the data was collected since they were kindergarteners. The researchers reported that the phonological awareness scores in kindergarten was highly related to the performance in phonological awareness 11 years later ($r=.47$). They admitted the persistence of phonological deficits over a period of 11 years and also recognized phonological awareness as a long-term predictor to word identification and spelling skills when the participants reached 17 years old. The influence of phonological deficits could be described as “Matthew effect”, in which children with good phonological awareness skills at the beginning get richer (i.e., better) in later reading skill development, while those with poor phonological awareness skills get poorer (Stanovich, 1986).

Definition and Assessment of Phonological Awareness

The role of phonological awareness and phonemic awareness has been well documented in literature. Numerous studies including correlational studies (Perfetti, et al, 1987), longitudinal studies (Bradley & Bryant, 1983; Lundberg, Frost, & Peterson, 1988), and training studies (Ball & Blachman, 1991; Cunningham, 1990; Hatcher, Hulme, &
Ellis, 1994) have reported that phonological awareness is a crucial predictor in early literacy development. In this section, the definitions for phonological awareness and phonemic awareness are clarified. Phonemic awareness and the alphabetic system is delineated. Furthermore, the measurement of phonological awareness is discussed and specified.

**Phonological Awareness**

Phonological awareness is a broader term which indicates the ability to identify and manipulate variable sizes of sound segments such as onsets-rimes, syllables, and phonemes in spoken words (Armbruster, Lehr, & Osborn, 2003; Yopp & Yopp, 2000). Phonological awareness is a prerequisite skill to reading in an alphabetical system through mapping sounds onto symbols and breaking words into their language components (Adams, 1990). For a general population of alphabetic systems, phonological awareness skills appear to develop in a particular sequence, in which the sensitivity to larger units such as words and syllables are detected before smaller units such as onsets and rimes as well as phonemes (Stanovich, 2000; Leafstedt, 2002; Muter, Hulme, Snowling, & Taylor, 1998).

Adams (1990) divided a child’s phonological awareness into five hierarchical categories: (a) knowing words are composed of sounds, and being able to remember
familiar rhymes; (b) being sensitive to sounds and able to recognize rhyme and alliteration in words; (c) being able to blend and segment words at syllable level; (d) being able to segment words at phoneme level; and (e) the ability to manipulate phonemes by adding, deleting, or altering phonemes to form a new word. However, the sequence and rate of phonological awareness levels vary across learners, and some skills overlap during development (Lane, Pullen, Eisele, & Jordan, 2002). Even typically developing children may be good at some levels but perform poorly at the others.

Abilities in phonological awareness at preschool age are a powerful predictor of later reading success (Bradley & Bryant, 1983; Lundberg, Olofsson, & Wall, 1980; Torgeson, et al., 1994). Specifically, skills in all levels of phonological awareness may contribute to later reading development, but the skills at the phoneme level are the most critical for literacy development (Hulme et al., 2002). Snow, Burns, and Griffith (1998) emphasized that phonological awareness allowed people to perceive that a spoken word was conceived as a sequence of phonemes. Individuals with phonological awareness are able to manipulate phonemes of a word such as blending, segmenting, deleting, adding, and substituting phonemes (Meschyan, 2002).

Still other researchers identified rhyming as a stronger predictor to reading development for young children. Abilities in rhyming seem to emerge earlier for young
children without formal reading instruction and predicts later word reading (Bryant, 1998; Bryant, MacLean, Bradley, & Crossland, 1990). Later when young children received early reading instruction in kindergarten or first grade, abilities in phoneme blending and phoneme segmentation appear to have stronger relation with reading (Chiappe, Siegal, & Wad-Wooley, 2002; Muter et al., 1998).

**Phonemic Awareness and Alphabetic System**

The most advanced level of phonological awareness addressed by Adams (1990) was regarding sounds manipulated at phoneme levels. Phonemes are the smallest units of sound. The word meaning may be changed by replacing one phoneme of a word with another; for example, the word meanings were different between *dog* and *dig* (Yopp & Yopp, 2000). Phonemic awareness refers to the ability to recognize and manipulate the phonemes of a word, which is an essential skill of an alphabetic system and involves applying knowledge of the relationship between phonemes (sound) and graphemes (print) (Goswami & Bryant, 1990).

The letter-sound correspondence emphasized by phonemic awareness serves as the foundation for future reading development (National Reading Panel, 2000; McCardle & Chhabra, 2004). Moreover, the abilities to know which letter corresponds to which sound and apply the letter-sound correspondence to read words are called “alphabetic
principle” (Ball & Blachman, 1991), which may help children extend their vocabulary learning to unfamiliar words. Juel (1988) pointed out that phonemic awareness, along with alphabetic principle, was one of the determinants to later reading performance because the abilities to decode would contribute to word recognition, and the development of word recognition would in turn facilitate the abilities to read connected text.

Phonemic awareness is a part of phonological awareness because it indicates the ability to recognize and manipulate only the smallest units in spoken words. Armbruster, Lehr, and Osborn (2004) specified children with phonemic awareness at least have four skills: (a) the ability to identify which words share the initial sound with other words, revealed by being able to isolate the first sound in a word. (b) the ability to blend individual sounds orderly and pronounce the whole word accurately. (c) the ability to segment a word into individual sounds. (d) the ability to relate individual sound to graphemes (e.g., the letter “h” is the written representation of the phoneme of /h/).

Measurement in Phonological Awareness

There are a number of phonological awareness skills which can be measured by various tasks to indicate the abilities to manipulate the smaller units within a word such as the syllables, onsets and rimes, and individual phonemes. For example, one-syllable
word *probe* could be analyzed with various levels: the syllabic level is /prob/, the onset-rime level is /pr-ob/, and the phoneme level is /p-r-o-b/. Due to the individual differences of phonological awareness development, each child may be good at some skills but perform poorly in others. It makes sense to determine students’ levels of phonological awareness skills by assessments before phonological awareness instruction to understand which skills need to be trained (Watts, 2001). In addition, assessment could be a means to monitor students’ progress during intervention. What follows is a description of the typical assessments which measured different linguistic levels including syllables, onset-rime or phoneme level (measures in word level are not phonological awareness tasks).

The frequently used measurements of phonological awareness include auditory discrimination, blending, counting, deletion, isolation, rhyme, segmentation, substitution, sound categorization, tapping, and reversing order of sounds (Ball & Blachman, 1991; Lundberg, et al., 1988; Yopp, 1988). Torgesen, Wagner, and Rashotte (1994) divided the assessment in phonological awareness into two levels. The sensitivity to rhyme or alliteration was required at the beginning level, such as identifying which of three words begins or ends with the target word. The advanced level involved explicit manipulation or
separation of the individual sounds, such as pronouncing the initial sound of a word, or pronouncing a word with deletion of a specific phoneme.

Based on Adams (1990), phonological awareness could be measured by five tasks: phonemic segmentation tasks, phonemic manipulation tasks, syllable-splitting tasks, blending tasks, and oddity tasks (e.g., recognize which word was different from others based on the first, middle, or last sound). Wang (1999) also categorized phonological awareness tasks in alphabetical system in syllable, onset-rime, and phoneme levels. Torgesen and Patricia (2002) grouped all “phonemic” awareness measures into three broad categories: sound comparison, phoneme segmentation, and phoneme blending. They did not include measures on sensitivity to rhyme or syllables because the larger units in a word seemed less predictive of reading disabilities than individual phonemes. The details are as the following:

(a) Sound comparison

Sound comparison, sometimes is called “phoneme identity” and involving a variety of formats, requires children to make comparisons between the sounds in different words. This test is appropriate to use on kindergarten-age children because it focuses on basic level without asking children to pronounce or manipulate the individual phonemes. For example, children are required to choose a word that begins or ends with the same
phoneme of the target word (e.g., *dog*, *cup*, and *mat*, which has the same first sound as the word *cat*?). Another example is to ask children to provide another word beginning or ending with the same phoneme of the target word (e.g., show a picture of *cat* to children and ask them to provide another word beginning with the same phoneme of *cat*). The target word could be presented orally or by a picture without the any words or letters on it.

(b) **Sound blending**

In the 1990s the term “synthesis task” was sometimes used to indicate sound blending (e.g., Torgesen and Bryant, 1994). In sound blending, children are orally presented onsets and rimes, or a sequence of separate phonemes. They are required to blend them together and create a word (Hegal, 1998; Watts, 2002). For example, tasks in onset-rime blending require children to blend rimes and onsets to form a word (e.g., what word does the sounds of /d/ and /og/ make?) Phoneme blending skills are measured by asking children to blend three to four phonemes into words (e.g., what word do we have if the sounds /m/-/o/-/p/ are put together?). Easier variants of phoneme blending tasks can be produced by presenting three pictures without words or letters on it and requiring children blend the sounds to find which picture requested (Torgesen & Mathes, 2002).
(c) Sound segmentation

Sound-segmentation skills, sometimes are called “analysis” tasks, are most frequently used when measuring phonological awareness. Sound segmentation tasks require a relatively explicit level of awareness of phonemes and are viewed as high-level ability in the hierarchy of phonological awareness (Hegal, 1998; Watts, 2002). It involves in requiring children to break a word into smaller sound units and read them orderly. Different levels of segment could be analyzed such as syllable, onset-rime, and phoneme. Some children may not successfully segment at the phoneme level but are able to segment words at the onset-rime level. Segmentation at the phoneme level is commonly used in assessments, including segmenting the initial, middle, or last phoneme of a word (e.g., what sound does hit start with?), or segmenting a one-syllable word into three to four phonemes (e.g., what sounds do you hear when I say man?). Phoneme counting (tapping), defined as identifying the number of phonemes contained in a target word, is a variation of sound segmentation (Bruck, 1992). For example, what is the number of phonemes in cat?

Since most tests in phonological awareness put the emphasis on the phoneme level, Table 2.1 summarizes the frequently used measures of phonological awareness skill areas at the phoneme level. Wang (1999) divided into various categories phoneme
level of phonological awareness into various categories: (a) Phoneme segmentation, including the first sound identification (e.g., what sound does tap begin with?), or segmenting a word into individual phonemes (e.g., what sound do you hear in tap?). (b) Phoneme blending, including blending words divided into individual phonemes (e.g., what is the word composed of /t/-/a/-/p/?). (c) Phoneme deletion, including saying the word with deletion of one phoneme (e.g., if the /s/ sound was taken away from the word Sam, what word is left?). (d) Phoneme substitution, including replacing one phoneme with another (e.g., if replacing the /t/ sound in tap with the /c/ sound, what is the new word?). (e) Phoneme discrimination (oddity task), including choose a word with different first, middle, or last sound from other words (which word of tap, tall, dog, tom has a different first sound from others?). Additionally, also some variations exist, such as phoneme reversal (Mercer & Mercer, 2004).
<table>
<thead>
<tr>
<th>Types</th>
<th>Content</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoneme comparison</td>
<td>Require children to make comparisons between the sounds in different words.</td>
<td>1. Dog, cup, and mat, which has the same first sound as the word cat?</td>
</tr>
<tr>
<td>(phoneme identity)</td>
<td>1. Ask children to choose a word that begins or ends with the same phoneme of the target word.</td>
<td>2. Show a picture of cat to children and ask them to provide another word beginning with the same phoneme of cat</td>
</tr>
<tr>
<td></td>
<td>2. Ask children to provide another word beginning or ending with the same phoneme of the target word.</td>
<td></td>
</tr>
<tr>
<td>Phoneme blending</td>
<td>Listen to a sequence of separately spoken phonemes and blend them to form a word (Hegal, 1998; Mercer &amp; Mercer, 2004).</td>
<td>1. What is the word composed of /t/-/a/-/p/?</td>
</tr>
<tr>
<td>(synthesis task)</td>
<td>1. Blend words divided into individual phonemes.</td>
<td>2. When I say /pl/-/al/-/n/, which picture do you think it is?</td>
</tr>
<tr>
<td></td>
<td>2. Easier variants of phoneme blending tasks can be produced by presenting three pictures without words or letters on it and requiring children blend the sounds to find which picture requested (Torgesen &amp; Patricia, 2002).</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.1: Phonological awareness skill areas at the phoneme level (continued)
Table 2.1: Continued

<table>
<thead>
<tr>
<th>Phoneme segmentation (analysis task)</th>
<th>Break a word into smaller sound units and read them orderly</th>
<th>1. What is the first sound in <em>hit</em>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Phoneme isolations: segment the initial, middle, or last phoneme of a word (Armbruster, Lehr, &amp; Osborn, 2001).</td>
<td>2. Segment a one-syllable word into individual phonemes.</td>
<td>2. What sounds do you hear in <em>man</em>?</td>
</tr>
<tr>
<td>3. Phoneme counting (tapping): identify the number of phonemes contained in a target word (Bruck, 1992).</td>
<td>3. What is the number of phonemes in <em>cat</em>?</td>
<td>3. What is the number of phonemes in <em>cat</em>?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phoneme manipulation</th>
<th>1. Phoneme deletion: sound out the word after a particular phoneme is removed (Bryant, et al., 1990; Wang, 1999).</th>
<th>1. What word is left if the /t/ is removed from the word <em>task</em>? (Perfetti et al., 1987; Stanovich, 1984)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Phoneme reversal: reverse the order of phonemes in a word.</td>
<td>2. Say the phonemes of <em>tap</em> in the reverse order (Mercer &amp; Mercer, 2004).</td>
<td>2. Say the phonemes of <em>tap</em> in the reverse order (Mercer &amp; Mercer, 2004).</td>
</tr>
</tbody>
</table>
Table 2.1: Phonological awareness skill areas at the phoneme level

<table>
<thead>
<tr>
<th>Phoneme substitution</th>
<th>The word is <em>bug</em>. Replace the first sound /b/ for /n/. What is the new word? (Armbruster, Lehr, &amp; Osborn, 2001; Wang, 1999).</th>
</tr>
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<table>
<thead>
<tr>
<th>Phoneme discrimination (odddity task)</th>
<th>Recognize a word from three to four spoken words based on a unit of language such as first, middle, or last sound (Mercer &amp; Mercer, 2004).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. First sound: in the words <em>bag</em>, <em>nine</em>, <em>beach</em>, and <em>bike</em>, which word has a different beginning sound? (Stanovich, 1984)</td>
</tr>
<tr>
<td></td>
<td>2. Middle sound: in the words <em>pin</em>, <em>gun</em>, and <em>bun</em>, which word has a different middle sound? (Mercer &amp; Mercer, 2004)</td>
</tr>
<tr>
<td></td>
<td>3. Last sound: in the words <em>doll</em>, <em>hop</em>, and <em>rap</em>, which word has a different middle sound? (Mercer and Mercer, 2004)</td>
</tr>
</tbody>
</table>
Among all phonological awareness tasks, most children performed better on larger units such as syllables or rhyming than tasks at the phoneme level (Adams, 1990; Stanovich et al., 1984; Yopp, 1988). This may be because the larger units are in accordance with the phonological awareness development of children, and young children are often involved in activities dealing with syllables, onsets and rimes before receiving formal reading instruction. Implication elicited from development of phonological awareness indicated that tasks measuring sensitivity to rhyme and alliteration are appropriate to children aged 3 years old (MacLean, 1988). For older children, tasks measuring manipulating phonemes such as phoneme counting, phoneme deletion, phonemes switching, or initial sound categorizing are used.

Relationship Between Phonological Awareness and Reading

The relationship between phonological awareness and future reading abilities has been demonstrated in a number of research papers (Juel, 1988; Lundberg, Olofsson, & Wall, 1980; Wagner, & Torgesen, 1987). Some researchers assumed that phonological awareness, which differentiate between good readers and poor readers, was a predictor to future reading development (Mullady-DelliCarpini, 2005). Other researchers may hypothesize phonological awareness to be in reciprocal relationship with reading acquisition, indicating phonological awareness serves as both a cause and a consequence.
of reading (Bhat, 2000). Additionally, phonological awareness skills could be improved by reading instruction and practice. This section explores the phonological awareness in English alphabetic system, and demonstrates its relationship in learning to read.

Phonological Awareness is a Predictor to Subsequent Reading Achievement

Phonological awareness is causally related to reading acquisition in alphabetical systems (Ball & Blachman, 1991; Bradley & Bryant, 1983; Lundberg et al., 1988). Wagner and Torgesen (1987) reported that early performance on phonological awareness tasks in kindergarten or first grade is a powerful predictor of later reading achievement. In order to read, children first need to understand that a word is composed of smaller units and have the ability to break up words into sounds. Then, they are ready to learn letter-sound relationship to sound out unfamiliar words (Chaney, 1992). It seems that some minimal level of phonological awareness must be achieved to perform well in applying letter-sound relationship to read words (Tunmer et al., 1988). Specifically, phonological segmentation skills have been identified the most reliable predictor to apply alphabetic principle to pseudoword decoding, which in turn is necessary for new words learning and reading (Ehri et al., 2001; Muter, Hulme, & Snowling, 2002; Yopp, 1988).

Lundberg and his colleagues (1987) examined the effects of phonological awareness training on reading and spelling. The participants were kindergarten children
being divided into two groups. The experimental group received 20-25 minutes training per day focusing on rhyme production, word segmentation, syllable segmentation and synthesis (blending), deletion of initial phonemes and segmentation and synthesis (blending) of phonemes, while the control group did not receive any instruction. After entering the first grade for seven months, the experimental group outperformed the control group on measures in speed and accuracy of silent word decoding with only trend level (<.10) significance. The experimental group only significantly outperformed the control group on measure in dictated spelling test, and the effects were maintained until second grade, demonstrating the causal relationship between phonological awareness and reading.

Further, deficits in phonological awareness have been addressed to link to reading disabilities (Lyon, Schaywitz, & Shaywitz, 2003). Catts, Fey, Zhang, and Tomblin (2001) found that a kindergarten measure of phonological awareness was one of five factors to predict the label of reading disabilities in second grade. Although several other factors have been correlated with poor reading ability, Catts and Fey (1995) found that phonological awareness skills in kindergarten were the best predictors of second-grade reading ability. Synder and Downey (1997) also concluded that
phonological deficits are the most prominent oral language deficits in children and adults with reading disabilities.

Reciprocal Relationship Between Phonological Awareness and Reading

In addition to the predictive feature of phonological awareness to reading success, some researchers insisted the phonological awareness and reading were in reciprocal relationship (Cataldo & Ellis, 1988; Wagner, Torgesen, & Rashotte, 1994). That is, phonological awareness interacts with reading experience. Phonological awareness initially influences reading development; once reading is underway, the process of learning to read will in turn heightens the abilities in phonological awareness. Yopp (1992) addressed that “phonological awareness as both a prerequisite and a consequence of learning to read” (p. 697).

The reciprocal relationship is in correspondence with the finding of Morais, Cary, Alegria, & Bertelson (1979) that the illiterate adults in this study had poor phonological awareness skills. Evidence is also found when children try to read the decodable text. Children may try to pronounce a new word by the alphabetic principle, which positively impacts this self-teaching process both their vocabulary words and reading abilities are extended (Share, 1995).
For example, reading instruction focusing on decoding printed words gives the implications to sound structure of language and improves phonological awareness as well (Lundberg & Hoiien, 1991). Treiman and Zukowski (1991) found that dividing words into onsets and rimes was the first phonological skills children were able to do. They developed the segmentation skills at the phoneme level later at the beginning of learning to read, which implies the development of phonological awareness may also result from reading instruction in an alphabetic system. The bi-directional relationship between phonological awareness and literacy growth was apparent both in school-age children and preschool children, and the implication is that explicit instruction in phonological awareness both prior to and during reading instruction is important.

*Instruction in Phonological Awareness Accelerates Reading Growth*

Development of phonological awareness could be developed at early ages. Pullen and Justice (2003) indicated that performance on phonological awareness tasks of very young children was a reliable predictor to early reading achievement. They further supported phonological awareness to be taught in preschool classroom, especially for those with limited access to language play activities at home.

Numerous studies have demonstrated the effects of phonological awareness instruction on early reading success (Vellutino & Scanlon, 1987; Wagner, et al., 1997).
providing evidence that explicit training in phonological awareness skills positively influenced the gains on phonemic awareness, decoding, and spelling (Ball & Blachman, 1991; Bradley & Bryant, 1983). Bowey and Francis (1991) found that kindergarten children who were nonreaders did not have phonological awareness skills. Only after receiving explicit instruction were they capable of interasyllabic (onset-rime) or phoneme level. Recently high technology also confirms the positive relationship between phonological awareness instruction and reading growth. Functional magnetic resonance imaging (fMRI) reveals that systematic and explicit phonological based reading intervention significantly improves children’s abilities in reading fluency, and the activation in left hemisphere brain region, which is in charge of language, increased after intervention. The implication from fMRI is that reading intervention should be implemented as early as possible to prevent phonological deficits and later reading difficulties.

Explicit instruction in phonological awareness skills plays a critical role for those at-risk for poor reading achievement in order to prevent being labeled as having disabilities (Pullen & Justice, 2003). If combined with instruction in specific letter-sound relationship, phonological awareness instruction would produce the most powerful effects on subsequent reading growth (Ball & Blachman, 1991; Bradley & Bryant, 1985). That is,
in order to fluently read in alphabetic systems, it is better for people to be familiar with the correspondence between graphic representation (letter or letter strings) and its specific phoneme. The awareness of the internal phonological structure of words needs instruction (Liberman, et al., 1989). Only if children learn the alphabetic principle can they distinguish the word *cat* and the word *fat* by their initial phonemes, and know some letter strings only represent one phoneme such as the phoneme of *oa* in *boat* is /o/.

Phonological Awareness Instruction for Beginning Readers

The effectiveness of phonological awareness instruction on reading development has been demonstrated by existing studies. Generally, researchers indicated that the developing sequence of phonological awareness intervention has a studied paradigm starting at spoken words and syllables, rhyming skills, beginning sound awareness, onset-rime level blending, medial and final sound awareness and identification, and finally, phoneme-level blending and segmenting (Adams, 1998; O’Connor, Notari-Syverson, & Vadasy, 1996). However, the criteria for effective instruction were more than just focusing on “phonological awareness skills” of the intervention itself. The section analyzes the ingredients for effective phonological awareness training, and describes the previous phonological awareness research on preschool children.
Ingredients of an Effective Phonological Awareness Training

Most attention was focusing on instructional content of the training program and the teaching strategies. In 1993, Grossen and Carnine identified several essential components of successful training program to facilitate children’s reading abilities. These indicators included: First, letter-sound correspondences should be taught explicitly and systematically beginning at the most frequently used letter sounds. Second, phoneme blending should be taught for later word reading. Third, corrective feedback need to be delivered orally and immediately. Fourth, extensive practice should be provided, such as applying the learned letter-sound correspondence to read words. Snow and his colleagues (1998) identified critical elements of effective early reading intervention as teaching the alphabetic principle, promoting phonological awareness, and integrating these components with activities to develop comprehension and fluency skills.

Still some researchers emphasize how to increase the intensity of the phonological awareness training. O’Connor, Notari-Syverson, and Vadasy (1998) addressed that rhyming, phoneme blending, and phoneme segmentation could be taught on young children with mild disabilities using the instructional format of short-term intensive small group and individual instruction. Ehri and his colleagues (2001) further suggested other domains to specify effective phonological awareness instruction: the
small group instruction composed of three to five students, early implementation on preschool and kindergarten students, and relatively short duration of the instruction, ranging from approximately 300-600 minutes. Additional, concrete representation of sound is suggested by researchers, involving using objects (e.g., blocks, picture cards, plastic letters, magnetic letters) to represent a sound. For example, children may move a marker simultaneously when reading a phoneme after the teacher models the skill (Ball & Ballman, 1991; O’Connor, Jenkins, Leicester, & Slocum, 1993).

After reviewing evidence-based research, Foorman and Torgesen (2001) found the effectiveness of training program would be maximized on at-risk children if the instruction was delivered more explicitly and comprehensively, more intensely, and supportively in small-group or one-on-one formats.

Explicit and comprehensive instruction. Instruction for children who enter school with reading difficulties must be more explicit and comprehensive than typically provided in the regular classroom (Gillon, 2000). Most of the knowledge acquired in the process of typical reading development is found by the child during interactions with print. As children read, they notice useful generalizations about print-sound relationships, and they acquire a great deal of word-specific knowledge as well (the orthographic representations, or “sight words,” that are required for fluent reading) (Share & Stanovich,
1995). However, because of their weaknesses in the area of phonological processing, children at-risk for reading failure require explicit and systematic instruction to help them acquire the knowledge and strategies necessary for decoding print. As Gaskins, Ehri, Cress, O’Hara, and Donnelly (1997) have pointed out, “First graders who are at risk for failure in learning to read do not discover what teachers leave unsaid about the complexities of word learning. As a result, it is important to teach them procedures for learning words” (p. 325).

Recent intervention research with children at risk for reading failure has provided powerfully converging evidence that phonemically explicit interventions are more effective. Phonemically explicit, refers to as direct, systematic, and comprehensive instruction to build phonemic awareness and phonemic decoding skills (phonics). For example, one recent study (Torgesen, et al., 1999) demonstrated that, of three interventions tested on a sample of highly at-risk young children, the most phonemically explicit one produced the strongest growth in word-reading ability. In fact, of the three interventions tested, only the most explicit intervention produced a reliable difference in growth of word-reading ability over children who were not provided with any special interventions. This same pattern of results has been obtained in studies reported by Hatcher, Hulme, and Ellis (1994) and Iversen and Tunmer (1994).
Intensive instruction. The second characteristic of instruction for children at-risk for reading failure that differentiates it from general instruction is that it must be more intensive. Although children whose risk status is determined primarily by lack of previous instructional opportunities in the preschool environment may learn at average rates, they have much more to learn than children who come to school with typical levels of preparation (Hart & Risley, 1995) and thus must be given more intensive instruction if they are to keep pace in reading growth with their age peers. There are basically two ways to increase intensity for preventive instruction in elementary school. Either the total time in classroom instruction can be increased, or instruction can be provided individually or in small groups. Although increasing instructional time for reading in the regular classroom will help many children with mild risk status, the most practical method for increasing instructional intensity for small numbers of highly at-risk students is to provide small-group instruction. Meta-analyses consistently show positive effects of grouping practices that increase instructional intensity (Elbaum, Vaughn, Hughes, & Moody, 1999). One interesting fact is that one-to-one interventions in reading have not necessarily been shown to be more effective than small-group interventions (Elbaum et al., 1999).
Supportive instruction. The last characteristic of instruction for children who are at-risk for reading failure is that it must be more supportive both emotionally and cognitively. The need of at-risk children for more positive emotional support in the form of encouragement, feedback, and positive reinforcement is widely understood. However, their potential need for more cognitive support, in the form of carefully “scaffolded” instruction, is less widely appreciated. Scaffolded instruction involves finely tuned interactions between teacher and child that support the child in accomplishing a task that he or she could not do without the teacher’s help. Instruction for at-risk or reading-disabled children typically involves two types of scaffolding. One type of scaffolding involves careful sequencing, so that skills build very gradually—the information is systematically taught and practiced by the child. Another type involves teacher-student dialogue that directly shows the child what kind of processing, or thinking, needs to be done in order to complete the task successfully (Swanson, 1999). As Juel (1996) suggested, the ability to offer scaffolded support while children are acquiring reading skills may have increasing importance based on the severity of the child’s disability.
After reviewing the statements of the above researchers, more careful attention is needed to combine key ingredients when design or implement the phonological awareness instruction:

(a) Concrete representation could be used as supplemental aids (Ball & Blachman, 1991; O’Connor, et al., 1993)

(b) Letter-sound correspondences should be taught explicitly (Ball & Blachman, 1991).

(c) Phoneme blending and segmentation should be taught (O’Connor et al., 1993; Slocum et al, 1993)

(d) Systematical sequencing of the skills taught is needed (Torgesen & Davis, 1996)

(e) Instruction should be provided individually or in small groups (Ehri, et al., 2001)

(f) Corrective feedback needs to be delivered immediately (Grossen & Carnine, 1993)

(g) Teacher modeling and extensive student practice should be provided (Lundberg, et al., 1988, O’Connor, et al., 1993)

Nevertheless, despite the growing consensus regarding the best instructional practices to prevent reading failure, it is still not clear about the how much intensity and duration of instruction was required to adequate development of reading on children with phonological difficulties (Torgeseon, 2000). Hence, the knowledge about the specific instructional techniques still needs to be investigated in future research.
Phonological Awareness Instruction for Preschool Children

This extensive body of research showed that preschool children were able to benefit from phonological awareness instruction on reading (e.g., Bradley & Bryant, 1983; Hatcher, et al., 2004; Lundberg, et al., 1988; O’Connor, et al., 1993; Slocum, O’Connor, & Jenkins). Hence, phonological awareness could be implemented as early intervention to enhance the preschool children’s readiness for reading. In addition to typically developing children, phonological instruction has demonstrated effectiveness on children at-risk for reading failure (Bender, 1999).

(a) Study in Typical Population

In the 1970s, there were some researchers interested in phonological awareness instruction on young children. Rosner (1974) implemented early phonological awareness training on preschool children whose ages were 4 and 5. He trained the children to categorize words with their constituent sounds by adding, deleting, substituting, and rearranging phonemes. After training for several months, the participants had improvement in deleting the initial phoneme from words, and outperformed 6-year-old children. Also, they found the ability to rhyme was a predictor to later reading success and writing. Liberman, Shankweiler, Fischer, and Carter (1974) conducted the training in syllable and phoneme segmentation on 135 participants through preschool to first grade.
Results showed that preschool children performed better in syllable segmentation than phoneme segmentation. They concluded that young children were more sensitive to larger units in a word, which is in accordance with phonological awareness development. Liberman and his colleague concluded that for young children segmentation of smaller units such as phonemes was more difficult than segmentation of larger units such as syllables. Also, the preschoolers’ segmentation abilities was significantly enhanced when they became first graders and received formal reading instruction, which revealed that the increasing reading experiences might interact with abilities in phonological awareness.

In the study of Marsh and Mineo (1977), the phonological awareness intervention was focusing at the phoneme level. Thirty-four preschool children were divided into visual group and non-visual group with training in phoneme recognition. There were two between-subject factors: presence or absence of a visual cue (uppercase grapheme) and phoneme type (stops or continuous). Also, two within-subject factors were position of phoneme in the word (initial or terminal) and phonemic contrast of the minimal or maximal condition. “like” and “bag” was an example of maximal contrast condition because the two words had no overlapped phonemes, while “pan” and “dan” differed in only one phoneme and belonged to the minimal contrast condition. The visual cue group was trained to pair phonemes with corresponded graphemes, while the
instructional materials for non-visual group was only colored cards rather than graphemes.

All the children were required to choose the correct answers shown on the screen according to the question in the audiotape. Children in the stop condition identified which word of a pair contained either the phonemes /b/ and /d/ or the phonemes /p/ and /t/ in the initial or terminal position, while the pairs of phonemes in the continuant condition were /s/ and /m/ or /f/ and /n/. Results showed that phoneme recognition was teachable to preschool children, and the visual cue group outperformed the non-visual group on measures in phoneme recognition. Moreover, the continuants in the initial position seemed easier for young children and should be introduced earlier during instruction. However, the performance in stops was better if they were put in the final position.

Bradley and Bryant (1983) analyzed phonological awareness skills and reading level of preschool children who had not received formal reading instruction. The participants were divided into 4 groups based on their ages, verbal intelligence, and the scores of sound categorization on the pretest measures. Each group received instruction of different emphasis: Sound categorization was taught to Group 1 by means of differentiation if two words share a common sound in the beginning, middle, or final position. For example, *hen* and *man* were categorized together due to the same final sound /n/. In addition to sound categorization, Group 2 was taught alphabetic letters.
presenting sounds. Group 3 and Group 4 served as control groups: Group 3 was taught to sort pictures by their conceptual meanings, and Group 4 did not receive any training. Results indicated that Group 2 scored highest in reading and spelling among all the groups. The significant difference between Group 2 and Group 1 was performance in spelling. The researchers concluded that when combined with training in letter-sound correspondence, sound categorization instruction yielded the best effects.

In the longitudinal study of Lundberg and his colleagues (1988), the effects of phonological awareness training were demonstrated on preschool children. The participants in experimental group were involved in game-like activities introducing the instructional sequence of the concepts of rhymes, syllables, phonemes. On the contrary, children in control group did not receive any special training in addition to the regular preschool curriculum. Results showed improvement in phonological awareness on children in experimental group, especially at phoneme-level skills. However, there was no significant increase in their overall comprehension of oral instructions or vocabulary. The effects of phonological awareness training maintained to performance in reading and spelling through the end of second grade. The finding implied that phonological awareness could be trained on preschool children, and had positive impact on their later reading and spelling acquisition.
Byrne and Fielding-Bamsley (1989, 1990 1991, 1993) examined the effectiveness of phonological awareness training on 4- and 5-year old Australian preschoolers. In their study in 1989, the preschoolers were trained in phonemic identity, segmentation, and letter-sound relationship. The researchers further reported that training in phoneme identity resulted in greater generalization than training in phoneme segmentation (Byrne & Fielding-Bamsley, 1990). In the study in 1991, the experimental group receiving phonological awareness instruction outperformed the control group in phonological awareness on trained and untrained sounds and word decoding. Byrne and Fielding-Bamsley (1993) demonstrated the effectiveness of the phonological awareness training to preschoolers’ phonological awareness and reading skills. One year after the intervention has ended, the preschoolers in the experimental group scored higher on a forced-choice word recognition test than the preschoolers in the control group. In the follow-up data, the participants in the experimental group also outperformed in nonsense word reading and reading comprehension after the intervention has ended for 2 and 3 years.

Hatcher and his colleagues (2004) evaluated the effectiveness of phonological awareness instruction with different elements on 410 preschool children; some of them were at-risk for reading delays. All the participants were divided into 3 groups receiving
instruction with rhyming, phonological awareness, and no special training with phonological awareness. Rhyming group received instruction consisted of syllable identification and manipulation, rhyming matching, rhyme generation, and onset-rime linkage activities. Phonological awareness group was taught by syllables identification and manipulation, phoneme blending, segmentation, deletion, substitution, and transposition. Results showed typically developing children in all three groups performed well with no significant difference on posttest measures of reading. Children at-risk for reading failure receiving phonological awareness instruction with and without rhyming demonstrated the most gains on measures in word reading and non-word reading, especially when instruction was combined with rhyming. The rhyming-only group did not improve significantly on measures than other groups. The researchers concluded that when combined with rhyming, phonological awareness instruction yielded the best effects to children at-risk for reading delays.

(b) Study in Children with Phonological Deficits

In the 1990s, researchers investigated if training in only one phonological skill would promote transfer to other phonological skills without instruction. For example, does instruction in segmenting improve other skill areas such as blending? Does onset-rime segmentation improve the ability to segment words into individual phonemes?
In 1993, Slocum, O'Connor and his colleagues investigated if training in one phonological awareness skill would benefit the acquisition of the second skill. 35 preschool children with low receptive language skills was randomly assigned to 4 groups with two-phase training: blending then segmenting, word manipulation then segmenting, segmenting then blending, and word manipulation then blending. Blending was defined as pointing out the correct picture when onset and rime were orally presented. Segmentation was defined as learning to segment a word into onset and rime. Word manipulation was using analogues to manipulate sounds through experiences. Results showed blending and segmentation was teachable to young children, but there was little indication of transfer across skills. Only when the specific skill was taught did the children score better. However, the group with the instructional sequence of blending and segmenting significantly outperformed all three groups in each area tested.

O'Connor and his colleagues (1993) examined if phonological manipulation skills was teachable for preschool children with developmental delays. Forty-seven preschool children ages 4 to 6 years participated in the study, they were randomly assigned to 3 experimental groups: training in rhyming, phoneme blending, and phoneme segmentation. The control group did not receive any phonological awareness training. There were 2 phases in the intervention. Phase 1 contained only one task format in each
group: rhyming group worked on rhyme production, blending group was taught to combine two to three phonemes to form a word, and segmenting group began dividing a word in a sequence of individual sounds. In Phase 2, the learned task was reviewed by each experimental groups and the training was extended to other tasks within the treatment skill area. Rhyming group also tried to identify if two words rhymed and involve in rhyming oddity task (i.e., hat, cat, and cup, which of the three words did not rhyme?). Blending group began blending onset-rimes and read the word. Segmenting group not only segmented words into individual phonemes, but also began to segment words into onsets-rimes and identify the first sound of a word. During Phases 1 and 2, the control group engaged in general classroom activities in circle time without any special phonological awareness training. Results showed the experimental groups of blending and segmenting outperformed other groups, but little generalization was noticed within skill areas (i.e., only training in rhyming somewhat improved blending) except for phoneme segmentation. Training in segmentation improved measures both in segmenting and blending.

The intervention of Gillam and Kleeck (1995) was built around a broad array of phonological skills. The study was conducted on 16 preschool children with developmental speech and language disorders. The participants received instruction in
rhyming, identifying initial sound, sound matching, blending, and segmentation. Assessments of rhyming and phonological awareness skills focusing on phoneme level were used. Results showed significant improvements on measures of rhyming, sound matching, blending, and segmenting.

Blumsack (1996) conducted the study to confirm if phonological awareness instruction was effective. Twenty-five participants with language impairments were grouped into an experimental and a control group. Seventeen children with language impairments ranged from 5 to 7 years old participated in phonological awareness training program for the period of 9 weeks, and another 8 children received no intervention. Results showed that phonological awareness could be trained and have effects on some children with language impairments. In addition, not only did phoneme segmentation and blending skills improve, but the participants also performed better in word identification and developmental spelling skills.

In the study of Rvachew, Ohberg, Grawburg, and Heyding (2003), the participants were 13 children with expressive phonological deficits and 13 typically developing children between the ages of 4 year 0 month and 4 year 11 months. They were measured by several early literacy assessments, including phonemic perception, phonological awareness, alphabetic knowledge, literacy knowledge, and basic word
knowledge. The lower levels in phonemic perception (i.e., identify correct and incorrect pronunciations of words) and phonological awareness (tasks of rime matching, onset matching, and onset segmentation and matching) between both groups were found in children with expressive phonological deficits in comparison to children without deficits. No significant differences were found between the two groups on measures in alphabet knowledge, literacy knowledge, and basic word knowledge.

Rvachew, Nowak, and Cloutier (2004) examined the effects of instruction in phonemic perception on 17 preschool children with moderate to severe expressive phonological impairments. The control group consisted of another 17 preschool children with expressive phonological impairments who were not trained in phonemic perception instruction. The experimental group was trained to discriminate between correct and incorrect productions of words. The children were also measured in phonological awareness of rime matching and onset matching. Results indicated children receiving phonemic perception improved significantly on measures of phonemic perception in comparison to the control group. However, performance in phonological awareness assessment remained the same in both groups.

Gillon (2005) conducted a longitudinal study on twelve 3-year-old children with moderate and severe speech impairments for 3 years. In Study 1, performance in
phonological awareness on 12 children with speech impairments was monitored and compared to that of 19 children without speech impairments ages 3 to 5 years old. Study 2 was conducted when the target students were at 6 years of age. The measures in phonological awareness, reading, and spelling between the 12 target students and 10 children with speech impairments receiving no phonological awareness instruction were compared. Results indicated the explicit instruction was beneficial to the attainment of phonological awareness at the ages of 3 and 4. Moreover, the improvement of their phonological awareness positively influenced future performance in early reading and spelling.

Student Progress Monitoring

When implementing a specific intervention in reading, writing, or math, frequent, ongoing assessments over time are needed to document students' level of performance and monitor their progress. Not only can the researchers be informed the rate of students’ learning to make instructional adjustments or decisions, but the communication with families or other professionals about students’ progress is more efficient and may results in fewer special education referrals (Hasbrouck, Woldbeck, Ihnot, & Parker, 1999). This section describes the purpose of ongoing assessment; then, commonly used measures, including Curriculum-Based Measures (CBM), Mastery Measurement, and Dynamic
Indicators of Basic Early Literacy Skills (DIBELS), are introduced which gives implications to assess pre-reading and reading skills.

*The Purpose of Ongoing Assessment*

Assessments, which can be implemented individually or in an entire class, are scientifically based practices to measure students’ academic performance and evaluate the effectiveness of instruction. There are 3 purposes of assessments when implementing an intervention, including identifying students who are “treatment resister” and need supplemental instruction, guiding instructional planning, and monitoring student progress (Good & Kaminski, 2001). A variety of assessments are used in education, including norm-referenced tests, criterion-referenced tests, curriculum-based measures, rating scales and checklists, and anecdotal data (Kauffman, 2005). However, not every type of assessment is administered frequently to give immediate information for student progress.

If a child is identified as at-risk for reading abilities and a specific intervention is provided, the progress had better be frequently monitored to see how the child responds to intervention (Fletcher, Lyon, Fuchs, & Barnes, 2007). Progress can be monitored on a frequent basis (e.g., weekly or monthly) using probes-brief, easily administered measures. Progress monitoring assessments are quick probes that provide teachers with on-going
information about students' response to intervention as well as provide a more positive experience for learners. It can also be invaluable for teachers to see if our lesson aims have been fulfilled and the overall objectives have been met. It can also help us to assess student strengths and weaknesses and adjust the instructional planning. Ager and Newcomer (2003) regarded assessment as integrated component in effective instruction because the information obtained from assessment had implications for the existing problems and future instructional planning.

Although strategies of progress monitoring vary from one learning area to another, it lends a hand to instructional gains if correctly employed. In a recent study, Olinghouse, Lambert, and Compton (2006) investigated whether 2 different progress monitoring assessments differentially predicted growth in reading skills associated with systematic phonics instruction. Oral reading fluency was compared with an intervention aligned word list as predictors of growth in untimed and timed decoding and word identification and text reading accuracy, fluency, and comprehension. Results from 40 children with reading disabilities, Grades 2-5, indicated that intervention aligned word list accounted for unique variance in change on measures of decoding and word identification, whereas the oral reading fluency measure accounted for unique variance on passable reading fluency gains.
Curriculum-Based Measures and Mastery Measurement

Curriculum-based measures (CBM) are widely used in special education to monitor the student performance. CBM links assessment to intervention by evaluating the student by means of the curricular requirement of the student’s own classroom or school. For example, if the goal of the instructional unit is to spell certain words, CBM will assess student’s performance on these words (Fuchs & Deno, 1994; Tindal & Nolet, 1995). Curriculum-based measures, through direct and continuous assessment of basic skills, are a particular type of standardized assessments that allow a teacher to determine students' progress toward long-term goals (Deno, 2003). For example, results of CBM could inform the teacher to determine the number of words correctly read per minute by students. The frequent, systematic, and repeated measures of the learning tasks with results presented by graph or chart allow the teacher as well as the students be informed clearly about how them progress regardless of the changed curricula over time or district (Fuchs & Fuchs, 2002).

Mastery measurement approaches, such as teacher-made unit test, informs teacher whether the students has learned the particular skills covered in a unit. It is often helpful if teachers develop time-efficient, simply administered probes to assess student's progress towards mastery of the subskill. For example, when working on a particular
phonics patterns (i.e., short a and i) probes assessing student's ability to correctly decode and spell the words with these patterns may be used. Mastery measurement, which is somewhat different with CBM, was differentiated by its aims for assessment. CBM provide regularly measure information about whether the students are learning at a pace that will allow him or her to meet annual learning goals. Progress toward meeting the student’s goals is measured by comparing expected and actual rates of learning (Safer & Fleischman, 2005). Based on these measurements, teaching is adjusted as needed to facilitate student’s progression of achievement (McMaster, Fuchs, Fuchs, & Compton, 2002).

Dynamic Indicators of Basic Early Literacy Skills (DIBELS)

DIBELS was developed by Good and Kaminski (1996) to provide continuous assessment of students’ fluency with fundamental literacy skills and to predict future reading skills. Based on a prevention-oriented model, DIBELS measures all skills regarded as “Big Ideas of Early Literacy”: phonological awareness, alphabetic principle, fluency with connected text, vocabulary, and comprehension. The subtests within the DIBELS have been empirically validated. It consisted of 7 subtests: Letter-Naming Fluency, Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, Oral Reading Fluency, Story Retell, and Word Use Fluency.
There are at least 2 subtest in DIBELS directly related to phonological awareness skills. Phonemic Segmentation Fluency (PSF) assess whether a child is able to produce the individual sounds in the correct sequence when a spoken word is presented. Words composed of 3 to 4 phonemes are used. In addition, Nonsense Word Fluency (NWF) assesses if a child could apply letter-sound correspondence to read words. Nonsense words (e.g., num, kic, feg) are used to prevent students from correctly responding due to the familiarity of the words tested.

Advantages of using DIBELS for student progress monitoring have been identified by Good and Kaminski (2002). First, the easy administered and time-efficient procedures allow frequent usage possible, and the students’ response to intervention could be rapidly determined. Second, the measures are instructionally relevant and in accordance with the focus of early reading intervention, which drives the results to instruction.

Summary

Important issues concerning phonological awareness are addressed in this chapter, including student at-risk for reading disabilities, key concepts of early literacy acquisition, the crucial role of phonological awareness, phonological awareness instruction for beginning readers, and the purpose of student progress monitoring.
Children are often deprived of the right entitled to reading and writing, which accounts for a significant part of the overrepresentation problem in special education. To solve the problem, it calls for development of reading programs and delivery of early reading intervention. While the phonological awareness training lends a hand to early literacy acquisition, the intervention increases the activation in children’s left hemisphere brain and, thus, improves their abilities in reading.

The phonological awareness plays a crucial role in reading and literacy. As the key component that makes the difference between good readers and poor readers, it is often referred to as a predictor to subsequent reading achievement. Although training in phonological awareness skills facilitates positive gains in phonemic awareness, decoding, and spelling, it requires activities characterized as explicit, comprehensive, intensive and supportive. As the phonological awareness instruction is implemented, ongoing assessments over time are essential to documenting learners’ performance and monitoring their progress. CBM including DIBELS are frequently used by teachers to determine the progress towards the grade-level expectation or long-term goals.
CHAPTER 3

METHOD

The methods used in this study are described in this chapter. Specifically, this section includes the participants, setting, researcher and observer, definitions and measurement of the dependent variables, definition of the independent variable, materials, interventionist training, experimental design, procedures, interobserver agreement, procedural integrity, and social validity.

Participants

The participants in this study were 3 preschool children selected from a special-needs preschool located within an elementary school. A graduate student majoring in early childhood delivered the instruction in the study. The following describes the preschool children and the graduate student interventionist.

Preschool Children

Three preschool children were selected for the supplemental phonological awareness instruction from the special-needs preschool in Columbus, Ohio area. The preschool classroom consisted of one classroom teacher, one full-time instructional
assistant who was mainly in charge of a child at-risk for behavior disorders. Sometimes a speech-language pathologist came to the classroom for pull-out therapy on several children. The participants’ ages were between 5 and 6 years old. They attended the preschool each weekday from 9:00 a.m. to 11:45 a.m.. The participants had not been identified with any special education disability label. This was a special-needs inclusive classroom: some of students were at-risk for future difficulties, and others were typically developing children. Three participants were selected based on the results of teacher nominations, screening for reading achievement, school attendance, and parental consent.

Screening procedures of the participants included these steps:

*Teacher nominations.* First, the researcher (a doctoral candidate) and the interventionist (a graduate student) observed all students’ interaction of pre-reading activities in the circle time twice. After 2 observations, the researcher held a meeting with the classroom teacher and the interventionist to explain the purpose and the procedures of the study. The teacher was asked to nominate students who exhibited poor pre-reading skills and might benefit from additional instruction.

*Screening for reading achievement.* All students in the special-needs preschool were assessed using the *Woodcock Reading Mastery Test-Revised Form G* (Woodcock, 1987) Letter Identification and Word Attack subtests, *Get it Got it Go* (University of...
Minnesota, 2001) Rhyming test, phoneme-blending test and phoneme-segmentation test designed by Laughon (1989). The screening foci in these tests included alphabetic reading, nonsense word reading, identifying which of 3 words rhymed with the target word, blending individual sounds to form a word, and segmenting each separate sound when a spoke word was presented. Based on the results of these assessments, students exhibiting poor pre-reading skills were identified as at-risk for reading disabilities and possible participants for this study.

School attendance. Regular attendance was one of the eligibility requirements to participate in this study. Previous school attendance records were reviewed, and students with potentially poor attendance were excluded from the study.

Parent consent. A letter introducing the purpose of the study and a consent form were sent to parents of the potential participants (See Appendices A and B). Written consent was obtained before beginning of the study. In addition, an oral solicitation using understandable sentences was read to the preschool children by the researcher (Appendix C). Children without written consent were also excluded from the study.

Tracy (Student 1) was an African American female with the age of 5 years and 8 months at the beginning of the study. She lives with her little sister and parents. In the Woodcock Reading Mastery Test, Tracy scored 32 points on the Letter Identification
measure and zero on the Word Attack measure. Tracy correctly identified 0 item in the Rhyming test of *Get it Got it Go*, and the gap between the aim line and Tracy’s performance was 14 items. Tracy scored 2 points of the total 54 points in the phoneme-blending test and scored 1 point of the total 51 points in the phoneme-segmentation test.

Steph (Student 2) was a Caucasian American male with the age of 5 years and 1 month at the beginning of the study. He lives with his little brother and parents. In the *Woodcock Reading Mastery Test*, Steph scored zero both on the Letter Identification measure and the Word Attack measure. Steph correctly identified 1 item in the Rhyming test of *Get it Got it Go*, and the gap between the aim line and Steph’s performance was 10 items. Steph scored 2 points of the total 54 points in the phoneme-blending test and scored 2 point of the total 51 points in the phoneme-segmentation test. Sometimes Steph uttered unreal sounds in the circle time. He has not been diagnosed with the label of language disorders but received speech-language therapy in school.

Henry (Student 3) was a Caucasian American male with the age of 5 years and 5 months at the beginning of the study. He has an older brother who attends the kindergarten within the same elementary school and lives with his parents. In the *Woodcock Reading Mastery Test*, Henry scored 32 points on the Letter Identification
measure and zero on the Word Attack measure. Henry correctly identified 7 items in the Rhyming test of Get it Got it Go, and the gap between the aim line and Henry’s performance was 6 items. Henry scored 0 point of the total 54 points in the phoneme-blending test and scored 0 point of the total 51 points in the phoneme-segmentation test. Henry has not been diagnosed with the label of language disorders but received speech-language therapy in school due to few pronunciation errors. Although he understood change of 1 phoneme might result in different word meanings, he always replaced the sound /k/ with the sound /t/.

Through observations by the researcher and the interventionist, all participants were engaged in typical social interactions with adults and peers. In addition, they had the prerequisite skills of the study, including verbal imitation and direction following. That is, each participant was able to imitate letter sounds modeled by the interventionist and follow 1- or 2-step directions. However, no standardized test was administered to formally assess these abilities. The demographic information of the participants is presented in Table 3.1.
<table>
<thead>
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<th>Student</th>
<th>1</th>
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<th>3</th>
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<tbody>
<tr>
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<td>Henry</td>
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<tr>
<td>Phoneme-segmentation test</td>
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<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3.1: Demographic information of the participants
Interventionist

A graduate student, Ms. B who was a student in the special education early intervention program at The Ohio State University participated in the study as the teacher/interventionist. She is a Caucasian American female and was licensed in early childhood special education by the end of the academic quarter. Ms. B has a Bachelors degree in Elementary Education with two certificates: one is in elementary education; another is early intervention (toddlers from birth to age 3). She had 5-year teaching experience, including teaching phonological awareness to kindergarten children. At the time of the study, she was in the last quarter of her licensure program and was preparing to interview for teaching positions. Being a native English speaker with teaching experience with young children, Ms. B is a suitable person to be the interventionist of phonological awareness instruction. She was trained by the researcher twice prior to the study to correctly implement the instructional procedures of the phonological awareness instruction in this study.

Setting

This study was conducted in a special-needs preschool within a public elementary school. The school was located about 12 miles away from downtown, just between the rural area and a large urban city. Families in the district were primarily from
the working-class consisting of blue collar workers and small farmers. The school had an enrollment of 475 students from preschool though grade 3.

The phonological awareness instruction for the 3 participants took place in a special-needs preschool. A typical day in the preschool classroom began with the student hanging their schoolbags on the wall based on their name tags. All preschool students were engaged in the circle time from 9:00 a.m. to 9:15 a.m. at which time the classroom teacher took the attendance and snack count. The second circle time was held from 10:15 a.m. to 10:30 a.m. It was one of the regular schedules in the preschool classroom, consisted of pre-reading activities such as letter naming, story reading, and conceptual knowledge (e.g., the weather, farm animals, the ocean). Students had the chance to answer teacher’s questions regarding the content introduced or follow the teacher’s model to read words. The phonological awareness instruction for the participants took place in a separate room close to the special-needs preschool classroom. There was a rectangular table (5’X 2’) in the room that allowed the interventionist to sit across the participant. The assessments, including progress monitoring, maintenance, and generalization, were also administered in the same room. The interventionist, Ms. B, provided the phonological awareness instruction on one-on-one, pull-out basis during the
free play time from 9:15 a.m. to 10:15 a.m.. Each participant received the instruction for 15 minutes per day from Monday to Friday.

Researcher and Observer

The primary researcher in this study was a doctoral candidate in special education with an emphasis on learning disabilities and applied behavior analysis at The Ohio State University and with a minor in Speech-Language Pathology. She has a Bachelors degree in Chinese Literature and Secondary Education from National Chengchi University, Taiwan, and a Masters of Education degree in Special Education from the Taipei Municipal Teachers College, Taiwan. She worked as a general educator for several years in an inclusive classroom that consisted of adolescents with and without mild disabilities. She has been involved in conducting academic based research studies in junior high school in Taiwan and in a Columbus Public elementary school during recent years. She was not only the person who provided the entire training sessions for implementation of the phonological awareness instruction, but also served as the second observer/data collector including the interobserver agreement and procedural integrity for this study.
Definition and Measurement of Dependent Variables

Pretest Measures

Pretest measures were used as part of screening procedures for the participants and the scores were compared with the same measures in posttest to be informed of the participants’ progress. The pretest measures in this study included Letter Identification subtest and Word Attack subtest of the Woodcock Reading Mastering Test-Revised (1987), Rhyming test in Get it Got it Go (University of Minnesota, 2003), and phoneme-blending test as well as phoneme-segmentation test designed by Laughon (1989). These measures were listed on Table 3.2.

Letter Identification. Letter Identification subtest in the Woodcock Reading Mastery Test-Revised Form G (Woodcock, 1987) was used to measure the ability to identify letters of the alphabet. Letters were presented in uppercase (capital) or lowercase (small) forms. In addition, test items were presented in various type styles, such as Roman, Italic, or Bold types. There were totally 51 items in the test., and the acceptable response for each item consisted of either the letter name or the letter sound. During the pretest measures, all participants responded by saying letter names. The participants were tested individually, and the test ended when he or she failed to identify 6 letters consecutively. The interventionist followed the recommended procedures in the
examiner’s manual and asked “what letter is this?” when assessing the participants. When the letters on the test book were presented in front of the participant on the table, the interventionist sat in front of him or her with an identical word list on test record for response-recording. The stopwatch for the 1-minute timing was started when the participant vocally attempted the first letter. During the assessment no social praise or corrective feedback were provided.

**Word Attack.** The Word Attack subtest in the *Woodcock Reading Mastery Test-Revised Form G* (Woodcock, 1987) was used to measure the ability to apply letter-sound relationship to pronounce nonsense words, such as *dee*, *ap*, and *ift*. The words were presented visually to determine if the participants are able to read them correctly. The participants were tested individually, and the test ended when he or she failed to read six words correctly and consecutively. The interventionist followed the recommended procedures in the examiner’s manual. When the words on the test book were presented in front of the participant on the table, the interventionist sat in front of him or her with an identical word list on test record for response-recording. The stopwatch for the 1-minute timing was started after the first word was presented. During the assessment no social praise or corrective feedback were provided.
Rhyming test. Rhyming test in *Get it Got it Go* (University of Minnesota, 2001) measured the ability to identify which word of 3 words rhymed with the target word on preschool children. Stimulus cards with 4 colored pictures on each were presented to examine if the participants were able to choose words that rhymed. For example, the pictures on the stimulus card were *boat*, *coat*, *house*, and *pie*. The interventionist pointed to the picture “*boat*” and asked “the target word “*boat*”, then asked which word, *coat*, *house*, or *pie*, sounds the same as the word "*boat*”? Pointing to the correct picture (e.g., *coat*) or naming the picture could be counted as correct response. The test was administered individually and ended when the participant responded with 6 consecutive incorrect answers. The interventionist sat in front of the participant to display the stimulus cards during the assessment. Four sample cards were used for practice before the administration of the assessment. Two-minute timing was used during the assessment. The number of correct and incorrect responses was counted at the end of the 2-minutes. During the assessment no social praise or corrective feedback were provided.

*Phoneme-blending test.* On this test, the interventionist pronounced individual phonemes of a word orderly at the speed of 2 phonemes per second and asked the participant to combine the phonemes and read the word. By replicating the study of Torgesen, Morgan, and Davis (1992), the measures developed by Laughon (1989) with
high split-half reliability (.94) on kindergarteners was used. On this test, after completing 6 practice items including *me, no, in, man, fat,* and *get* with the corrective feedback, the participants started the test. The words used on the test were *if, saw, toy, she, moon, wash, like, which, jump, yellow, fast, bamboo, circus, almost,* and *mistake.* Points are counted based on the number of phonemes successfully blended, and the maximum score was 54. All the phonemes were orally presented to the participants, and the interventionist sat in front of the participant with a corresponding word list to record responses. The stopwatch for the 1-minute timing was started after the first response was presented. During the assessment no social praise or corrective feedback were provided.

*Phoneme-segmenting test.* On this test, the interventionist pronounced a word composed of 2 to 5 phonemes and asked the participant read the individual phonemes in the correct order. By replicating the study of Torgesen, Morgan, and Davis (1992), the measures developed by Laughon (1989) with high split-half reliability (.92) on kindergarteners was used. On this test, after completing 6 practice items including *day, no, key, good, cake,* and *man* with the corrective feedback, the participants started the test. The words used on the test were *hi, me, in, eight, back, won, join, work, cloth, beast, child, solve, grounded, craft,* and *splash.* Points are counted based on the number of phonemes correctly read, and the maximum score was 51. All the words were orally
presented to the participants, and the interventionist sat in front of him or her with a word list for response-recording. The stopwatch for the 1-minute timing was started after the first response was presented. During the assessment no social praise or corrective feedback were provided.

**Assessments during Intervention**

*DIBELS Phoneme-segmentation fluency test.* Phoneme Segmentation Fluency (PSF) test in the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) was used to examine if the participants were able to segment the individual phonemes in a word. DIBELS PSF was a progress monitoring assessments for kindergarteners. The participants were required to say the individual phonemes in the correct order when a word composed of 2 to 5 phonemes was orally presented by the interventionist. For example, some words used in the test were *get, worm, porch,* and *grabbed.* The participants would have to say /g/-/e/-/t/ to score the total 3 points of segmenting the word *get.* If the participant said /g/-/et/, he or she would obtain 2 points for producing two complete phoneme units. The participants were assessed individually with 1-minute timing to record the number of phonemes correctly responded.

*Nonsense word-reading fluency test.* Nonsense Word Fluency (NWF) test in DIBELS was used to examine if the participants were able to apply learned letter-sound
relationship to read words. DIBELS NWF was a progress monitoring assessments for first graders. On the NWF measures, each participant was presented with a letter-sized paper containing randomly ordered VC (vowel-consonant) and CVC (consonant-vowel-consonant) words. Some words used in the test were um, jac, zoj, and oc. The participants were required to produce the individual phoneme of each letter or read the whole word. For example, when the word jac was visually presented, total 3 points were obtained if the participant said /j/-/a/-/c/ or the whole word “jac”. The participants were assessed individually with 1-minute timing to record the number of letter sounds correctly responded.

**CBM.** A total of 25 lessons were designed by the researcher based on the instructional sequence of training manual of *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994). Six wordsets were used as the supplemental aids and each wordset was used in a series of tasks. In addition to warm-up activities dealing with rhyming, the repetitive instruction sequence included phoneme blending, phoneme segmentation focusing on first, last, or middle sound, letter-sound relationship. The details of the content for each lesson were summarized in Appendix D. The lesson topics were presented in Appendix E. The Curriculum-based measures (CBM), including pre-test and post-test, were administered daily immediately before and after the
instruction and the testing content was based on the lesson taught. The pre-test measure, served as the “daily baseline”, was used to determine if phonological awareness instruction was effective. That is, whether the participants learned the skills taught each day. One-minute timing was used to count the number of items correctly responded to both during the pretest and posttest CBM measures.

*Maintenance Probes*

Maintenance is defined as the extent to which the learner continues to correctly respond after part or all the intervention has ended (Cooper, Heron, & Heward, 2007). In this study, maintenance probes were administered every 8 lessons during the intervention conditions. The purpose of maintenance probes was to examine if the participant could still correctly respond to previously learned words after the explicit instruction had ended. That is, how many words correctly responded during the previous CBM measures could still be correctly answered without explicit instruction. The maintenance probes were administered in the same manner of the CBM measures. Each participant was assessed individually in the separate room. Since maintenance probe was focusing on letter-sound relationship to see if the participants could applied the learned knowledge to read word, a sheet with lists of words/letters was placed in front of the participant on the table, and the interventionist had an identical list to record the responses of the participant. In order to
avoid the participants’ correct responses were due to the recognition of the picture, wordsets were not used during test. One-minute timing was used to count the number of words/letter sounds correctly responded in maintenance probes.

**Generalization Probes**

Generalization probes occurred after the intervention has ended. Nonsense words composed of previously learned letter sounds were used to examine if the participants were able to apply the learned letter-sound relationship to read words that were not explicitly taught. Nonsense words were developed by the researcher to confirm the words were untrained. In addition, all words developed were one-syllable CVC (consonant-vowel-consonant) words in accordance with the phonological awareness development of preschool children and word structure in this study. One-minute timing was used to count the number of letter sounds correctly responded.

Table 3.2 summarized the definition of dependent variables based on when to administer (pretest measures, measures during intervention, and posttest measures).
Pretest Measures

1. Letter Identification in the Woodcock Reading Mastery Test
2. Word Attack (nonsense word reading) in the Woodcock Reading Mastery Test
3. Rhyming Test in Get it! Get it! Go (also used in mid-point measure)
4. Phoneme-Blending Test (Laughon, 1989)
5. Phoneme-Segmenting Test (Laughon, 1989)

Measures During Intervention

Measured every 3 days:
1. DIBELS PSF
2. DIBELS NWF

Measured daily immediately before and after intervention:
CBM pretest and posttest measures

Maintenance Probe: Measured every 8 lessons. Based on the words responded correctly on the previous CBM.
Mid-point Measure: Rhyming Test in Get it! Get it! Go

Posttest Measures

The same measures used on pretest, including
1. Letter Identification
2. Word Attack
3. Rhyming Test
4. Phoneme-Blending Test
5. Phoneme-Segmenting Test

Generalization Probe:
Measured untrained words composed of learned letter sound

Table 3.2: Definition of Dependent Variables
Social Validity

Social validity measurement was a way to evaluate the acceptability or viability of an intervention (Schwartz & Baer, 1991; Wolf, 1978). One means of conducting social validity data is by consumer satisfaction questionnaires. At the conclusion of the study, each consumer (i.e., the participants, classroom teacher, and parents) was asked to complete a social validity questionnaire about the opinions towards the effects, the procedures used, and other comments about phonological awareness instruction. The questionnaires were confidential and were given to the participants, the classroom teacher, and the parents in this study.

The classroom teacher, Ms. A, was given a social validity questionnaire for teacher (Appendix F) at the conclusion of the study. This social validity measurement was a modified version of the Teacher Post-Intervention Acceptability and Importance of Effects Survey (Lane & Beebe-Fраненбергер, 2004). The questionnaire for teacher was composed of a checklist on a 5-point Likert Scale and two open-ended questions with space for written response and comments. The 5-point Likert Scale questions were rated with a rating of 5 indicating strong agreement to the given statement and a rating of 1 indicating strong disagreement. Also, the teacher was given a list of the participants to rate the effectiveness of the intervention for each participant. The social validity
questionnaire for parents (Appendix G) consisted of a five-item checklist on a 5-point Likert Scale ranging from “Strongly Agree” to “Strongly Disagree”. Like the Teacher form, there were two open-ended questions with space for written response and comments. Three participants were also required to complete a modified version of the Lane Children’s Social Validity Interview (LSVI, Lane, 1999; Appendix H). Due to the young age of the preschool children, this form, including close-ended items and open-ended questions, was developed with simple description to enable the preschoolers understand. This form was completed by semi-structured interview because the preschoolers were not good readers of this age.

Independent Variables

Phonological Awareness Training for Reading developed by Torgesen and Bryant (1994) was implemented in this study. The researcher designed 25 lessons according to the content of the instructional sequence of the training program. Appendix D presented the content for each lesson with the wordset, and Appendix E indicated lesson topics based on the content. This program was used to examine if phonological awareness instruction could improve the abilities in phoneme-blending, phoneme-segmentation, nonsense and real word reading of preschool children at-risk for reading disabilities. This phonological awareness program was developed based on
empirically validated instructional principles that have been demonstrated suitable for kindergarteners or first- and second-graders at-risk for experiencing reading failure. It was designed to be implemented in small group format composed of 3 to 4 children for approximately 20 to 25 minutes per day. It can also be used for individual instruction.

There were 4 types of activities in this training program: (a) warm-up activities, including introducing the concept of rhyme, identifying if 2 words rhyme or not, choose which word rhymes with the target word; (b) phoneme-blending tasks, including blending words divided into rimes and onsets, and blending words divided into individual phonemes; (c) phoneme-segmentation tasks, including identifying words with the same first, middle, or last sounds; (d) letter-sound relationship tasks, in which the letter-sound relationship was systematically taught.

The phonological awareness skills in this study were taught and practiced using 6 wordsets. Words in the wordsets were taken from a list of the 2,500 words most frequently appearing in the oral language of first-graders. The wordsets composed of black-and-white pictures with no words or letters on it to represent the words used. Each wordset consisted of 12 words with limited number of new phonemes was used to five different tasks. The repetitive instruction of each wordset was utilized in order to maximize children’s familiarity with the letter sounds and generalize the learned letter
sounds to various tasks. Moreover, the new consonant phonemes were explicitly instructed with mouth and tongue positions for correct pronunciation.

Because the primary training program was designed to use with kindergarteners during second semester of the school year or first or second graders, the researcher of this study made some revisions for accommodation for preschool children. First, the colored cards with cartoons on it were used in warm-up activities (i.e., lesson 1, 2, and 3) to replace black-and-white cards in order to recruit the participants’ attention and elicit their motivation. Second, Wordset 5 and Wordset 8 in the primary training program were abandoned due to considerations of time limit and the participants’ age. The letter sounds /w/ and /sh/ in Wordset 5 seemed beyond the phonological development of young children in this study. Third, the number of words in each wordset was shortened from 20 to 12 because of the acceptability of the participants because twenty words per session seemed not affordable for preschool children. Fourth, instead of letter cards recommended in the primary training program, the magnetic letters was used that allowed the participants manipulate the concrete representation on the whiteboard, especially when teaching phoneme segmentation and letter-sound relationship. Fifth, instructional session for each participant was delivered 15 minutes a day because too much time seemed not affordable for preschool children on one-on-one format. In addition, the
game-like activities were abandoned because they were more adequate for small group instruction.

Interobserver Agreement and Procedural Integrity

Interobserver Agreement on Dependent Variables

Interobserver agreement (IOA) data for the assessments of phonological awareness skills were collected on 2 progress monitoring measures: (a) DIBELS PSF and NWF under the intervention conditions. (b) CBM pretests and posttests under the intervention conditions. The IOA data were collected at least 30% of assessment sessions of each participant. In this study, because the native English speaker served as the interventionist, the researcher who attended the experimental setting each day was the second observer. During assessments she sat next to the interventionist to hear the participant’s responding more clearly and independently recorded the correct number of phonemes produced in one minute on a copy of the data collection sheet.

The observer underlined the phonemes correctly produced by the participant in 1 minute in the same way as the interventionist. On the DIBELS NWF measures, the observers underlined the correct letter sounds produced by the participant in 1 minute. On the PSF measures, agreement was defined as both observers scored the same phonemes in a word produced by the participant. For example, if 1 observer scored /g/ /e/ /t/ but the
other observer scored /g/ /e/ /t/, or one observer scored /g/ /e/ /t/ but the other observer scored /g/ /e/ /t/, it was regarded as a disagreement.

On the NWF measures, agreement was defined as both observers scored the same letter sounds in the nonsense words produced by the participant. The percentage agreement was calculated by the number of agreements over agreements plus disagreements multiplied by 100. The IOA formula was the same as used in PSF and NWF measures.

\[
\text{IOA} = \frac{\text{Agreements}}{\text{Total number of agreement + disagreement}} \times 100
\]

The way to record the student responses on the CBM measures was similar to the DIBELS measure but varied with the phonological awareness tasks. In rhyming tasks, the observer was required to circle “yes” or “no”. That is, the selected word rhymed with the target word (correct response) or the selected word did not rhyme (incorrect response). In phoneme-blending, phoneme-segmentation, and letter-sound relationship tasks, the
observers were required to circle the phonemes correctly produced by the participant. The formula was the same as used in PSF and NWF measures.

**Procedural Integrity**

Procedural integrity is defined as the number of steps completed per session by the interventionist as intended (Gresham, Gansle, & Noell, 1993). It provides the feedback regarding how the interventionist implemented the intervention with fidelity (O’Shaughnessy, Lane, Gresham, & Beebe-Frankenberger, 2002). The interventionist, who served as the primary observer, completed the procedural integrity checklists daily immediately when the intervention session ended. The researcher was the second observer who observed and recorded independently. Each step was marked with a checkmark if the observer observed the step was completed by the interventionist.

**Procedural Integrity Checklist**

The procedural integrity checklist was an 8-item form which contains a number of steps regarding the implementing of the phonological awareness instruction (Appendix I). It was used to examine if the interventionist provided the pre-determined steps with fidelity during the intervention conditions.

The interventionist and the researcher served as observers throughout the study. Integrity data were collected by the interventionist each day for each participant. The
second observer collected data independently for at least 70% of the sessions for each participant. Agreement of the procedural integrity was the number of agreements over agreements plus disagreements multiplied by 100 to obtain a percentage. Agreements were those steps that both observers marked as occurring. Disagreements were any step that one observer marked as completed while the other did not note the step’s occurrence. The formula was:

\[
\text{Agreement of Procedural Integrity} = \frac{{\text{Agreements}}}{{\text{Total number of agreement + disagreement}}} \times 100
\]

Experimental Design

The experimental design selected for this study was a multiple probes across subjects design to examine the effects of phonological awareness instruction on the phoneme-blending, phoneme-segmentation, nonsense and real word reading of preschool children at-risk for reading disabilities (Baer, Wolf, & Risely, 1986). This design is appropriate to evaluate the effects of intervention on academic skills in which the
withdrawal of the treatment is not allowed (Cooper, Heron, & Heward, 2007). Moreover, another advantage to use this design is that the “probes” instead continuous data points avoid the extended data collection under baseline condition.

Assessment probes prior to the implementation of the intervention were used as baseline to demonstrate the participants’ low level of phoneme-segmentation and nonsense word reading skills before receiving the phonological awareness instruction. The baseline data served as comparison data for those data collected once the intervention had been implemented. Using multiple probes across subjects design, the intervention was introduced to the participants individually in stepwise fashion. That is, only when the effects of the intervention were demonstrated on the first participant would the intervention be introduced to the second participant; in the same manner, only when the effects of the intervention were demonstrated on the second participant would the intervention be introduced to the third student. The functional relationship will be demonstrated if there is a consistent change in the level and/or trend of the data when the intervention is introduced to each participant.

An additional maintenance probe was administered every 8 lessons during intervention condition. For Steph and Henry, who receive less than 24 lessons, the last maintenance probe was administered at the end of the study. Generalization probes were
implemented when the intervention has ended to investigate how the results generalized to untrained nonsense word reading composed of previously learned letter sounds.

Materials

*Stopwatch*

A standard digital stopwatch was used to time 1-minute in most assessments and 2-minute in Rhyming test in *Get it Got it Go*. The stopwatch was started when the participant vocally attempted the first word, letter, or items and stopped at the end of 1 minute or 2 minute.

*Phonological Awareness Training for Reading kit (Torgesen & Bryant, 1994)*

With revisions, some materials in *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994) were selected to use in the study. The materials included an audiotape for training, a training manual, 6 picture word card sets, and instruction of the mouth positions required to produce consonant phonemes.

*Rhyming picture cards*

Instead of rhyming cards made of black-and-white pictures attached in this training program, the colored picture cards were used in warm-up activities of lesson 1, 2, and 3 with the focus on rhyming. The black-and-white cards were replaced with colored picture cards because it was important to recruit young children’s attention and elicit their
motivation at the beginning of the intervention. The colored cards with cartoons on it might facilitate the effects of the warm-up activities to the maximum.

*Magnetic letters and the whiteboard*

Instead of the letter cards attached in this training program, the magnetic letters were used in this study to provide concrete representation for manipulation. The magnetic letters allowed young children to manipulate letters on the small whiteboard which were especially helpful for activities in letter-sound correspondence.

*Reinforcers*

Each participant was given a reinforcer if he or she exhibited cooperative behaviors during intervention. The criterion for receiving the reinforcers was the “cooperative behaviors” rather than “high correct percent of response” to reduce the possibility that the participants just guessed at answers. Before the implementation of the intervention, the interventionist introduced the criterion for the reinforcers to the participants and reminded them to “try hard for learning and test-taking”. After discussion with the classroom teacher, most reinforcers were correlated with the weekly topic of the circle time, such as sheep, horses, flowers, insects, etc.
Interventionist Training

Interventionist training had to be completed before the pretest measures and baseline data collection. Because phonological awareness instruction was required to be implemented by a native English speaker, the researcher who was an international student trained Ms. B on how to implement the independent variable, *the Phonological Awareness Training for Reading*, in 4 steps. First, Ms. B was listening to an audiotape in which there was an auditory demonstration for the rate of reading individual phonemes in phoneme-blending tasks. The examples covered the various types of phoneme-blending skills taught, including words segmented into onset and rime and words segmented into individual phonemes at a standard rate of delivery or at rapid speed. Second, the materials in the study were introduced by the researcher, including the phonological instruction training program kit and the supplemental aids, such as 6 picture word card sets, instruction of the mouth positions to produce consonant phonemes, rhyming picture card, magnetic letters and the whiteboard. The researcher and the interventionist read the instruction of the mouth positions together and practice each letter sounds introduced. Also, how to use the magnetic letters to aid the instruction in letter-sound relationship was emphasized. Third, the researcher modeled the activities in the lessons, including the rhyming, phoneme-blending, phoneme-segmentations based on first, middle, or last
sounds. Ms. B was asked to practice steps of theses tasks and provided with immediate feedback. Finally, the delivery of positive or corrective feedback to the participant was also modeled by the researcher followed by the practice of the interventionist. Positive feedback included the repetition of the correct answer and the praise, such as “that’s right. /P/-/o/-/p/ is /pop/”, “good job”, or “I can tell you are trying hard”. Examples of the corrective feedback were “no, the two words sound differently at the end, so they do not rhyme” or “the first sound of dog is /d/, not /t/”.

**Procedures**

Using multiple probes across subjects design, each participant’s progress was monitored across 2 conditions-the baseline condition, followed by the intervention condition. Prior to and at the conclusion of the intervention, each participant was also assessed by a number of pretest and posttest measures.

**Pre-study Assessment**

In addition to screening potential participants of the study, the pretest measures also provided descriptive evidence and implications for the participants’ learning. Prior to the implementation of the study, there were 5 test administered: (a) Letter Identification subtest in the *Woodcock Reading Mastery Test-Revised* (Woodcock, 1987), (b) Word Attack subtest in the *Woodcock Reading Mastery Test-Revised* (Woodcock, 1987), (c)
Rhyming test in *Get it Got it Go*, (d) phoneme-blending test developed by Laughon (1989), (e) phoneme-segmenting test developed by Laughon (1989).

**Baseline**

During the baseline condition, participants did not receive any formal pre-reading instruction, including phonological awareness instruction. The only pre-literacy related activities were those that were part of the special-needs preschool was regular 15-min circle time twice each day. The DIBELS PSF and NWF progress monitoring measures were administered on all participants once a day during baseline on one-one-one basis in a separate room during free play time from 9:15 a.m. to 10:15 a.m..

The extended baseline varied across subjects in multiple probes across subjects design. The baseline data collection for all participants began at the same time, but only the first 3 probes were collected for Steph and Henry. Tracy was the first participant to introduce the intervention. When the stability was shown on the dependent variables in baseline for Tracy, the intervention was implemented. Steph’s baseline data were re-collected before the intervention was introduced to Tracy. When the stability was shown on the dependent variables in baseline for Steph, he was introduced to the intervention condition. In the same manner, the baseline data were collected, and the intervention was introduced to Henry.
Intervention

When Tracy reached stable levels of responding in the baseline condition, Lesson 1 of the phonological awareness instruction was instructed. Tracy received the instruction on one-on-one basis in a separate room close to the preschool classroom. The intervention was implemented for 15 minutes a day from Monday to Friday during free play time from 9:15 a.m. to 10:15 a.m. so no regular classroom activities was influenced. Probe data during the intervention condition was collected every three days.

Data collected was visually represented in graphic format to determine if there was functional relationship between phonological awareness instruction and the dependent variables. The intervention was introduced individually in a time-lagged fashion among the three participants. Once stability (including increasing trend) was established for the first participant (Tracy) in intervention condition, the phonological awareness instruction was applied to the second participant (Steph). Likewise, when stable levels of responding (including increasing trend) were observed for Steph, intervention was applied to the third participant (Henry). As mentioned earlier, intervention probes were administered every three days.

Training for each participant proceeded by a 3-lesson warm-up period in which the interventionist played a variety of rhyming and beginning-sound games with the
purpose to establish rapport and gradually move the children from familiar to relatively unfamiliar activities. Moreover, these activities provided the concepts for the participants that a word could be separated into smaller units. Rhyming picture cards was used in the 3 sessions of the warm-up activities: introduction to the concept of rhyme, choosing words that thyme, and identifying rhyming words.

Then, the participants engaged in training activities which were designed to help them learn to blend and segment phonemes. Wordset 1 linked rhyming to phoneme blending. The participants were taught to blend words divided into rime-onset (e.g., /k/-/at/ and /d/-/og/) and individual phonemes (e.g., /k/-/a/-/t/, /d/-/o/-/g/). They were also trying to identify words with the same initial sound, which was a transitive activity to advanced phoneme-segmentation skills.

Wordsets 2, 3, and 4 were used in repetitive instruction format composed of phoneme blending, phoneme segmentation, and letter-sound relationship. Each wordset was used in the same series of activities in 5 lessons, including blending words divided into individual phonemes, identifying words with the same first, last, or middle sounds. In addition, letter-sound relationship was systematically taught. Words in Wordsets 5 and 6 were previously shown in Wordsets 1 to 4 and used in the review session to strengthen
the learned letter-sound relationship to read words. The magnetic letters were
manipulated as the supplemental aids when lessons were instructed.

Maintenance

Maintenance probes were administered every 8 lessons during the intervention
condition to examine how many words correctly responded during the pervious CBM
measures could still be correctly answered without explicit instruction. Each participant
was assessed individually in the separate room. One-minute timing was used to count the
number of letter sounds/items correctly responded in maintenance probes.

Generalization

Generalization probes were assessed after the intervention has ended using
nonsense words composed of learned letter sounds. The nonsense words were developed
by the researcher to examine if the participants were able to apply the learned
letter-sound relationship to read words without explicit instruction. Each participant was
assessed individually in the separate room. One-minute timing was used to count the
number of letter sounds correctly responded.
Data Analysis

The data analysis was based on the types of the measures such as pretest and posttest measures or progress monitor during the intervention conditions. The details were described as the following:

*Pretest and Posttest Measures*

Results of Letter Identification and Word Attack subtests in *the Woodcock Reading Mastery Test* were presented by means of the raw scores, the grade equivalent score, and the age equivalent level. The percentile rank also gave implications about how the target students performed. Rhyming test in *Get it Got it Go* was presented using visual inspection method and analyzed by means of the gap between the participant and typically developing children. As for phoneme-blending test and phoneme-segmentation test designed by Laughon (1989), the data was presented by the comparison of raw scores in pretest and posttest measures.

*DIBELS PSF and NWF during Baseline and Intervention*

One feature of multiple probes across subjects design used in this study is to assess the individual participant repeatedly across baseline and intervention conditions (Dunlap, Cortina, Vaslow, & Burke, 1996). Thus, the data is analyzed using visual inspection and through mean and range in scores across baseline and intervention conditions.
conditions. The use of mean scores allowed minimal changes to be detected by the comparison of mean scores across two conditions (Lane, et al., 2002).

CBM during Intervention

Pretest and posttest CBM measures were administered every day immediately before and after the lesson instructed. Correct percent in both pretest and posttest CBM was reported to show the progress of correct responding of individual participant. The correct percent prior to and after the intervention was also presented using visual inspection.
CHAPTER 4

RESULTS

This chapter presents the results of the study. Specifically, this chapter begins with a discussion of interobserver agreement and procedural integrity, and addresses how the performance on phoneme blending, phoneme segmentation, and word reading can be explained by participation in the phonological awareness instruction for 3 preschool children at-risk for reading disabilities. Additionally, the results of the social validity measures will be described. The results were presented in the following sections: (a) interobserver agreement measures; (b) procedural integrity; (c) student performances on the dependent variables, including pre- and post-test data and curriculum-based measures during intervention; (d) social validity measures.

Interobserver Agreement

Interobserver agreement (IOA) data were collected throughout the study on (a) phoneme-segmentation fluency and nonsense word fluency in DIBELS; (b) pretest and posttest curriculum-based measures. IOA data were collected on part of the probes across study conditions. The data were reported across baseline and intervention conditions for
DIBELS PSF and NWF, and in terms of pretest and posttest in the intervention conditions for CBM.

**IOA on DIBELS PSF and NWF**

As previously indicated in Chapter 3, an independent observer participated in sessions involving DIBELS assessment both during baseline and treatment conditions. The data were summarized on Table 4.1.

As shown on Table 4.1, the IOA for Tracy were collected on 20 out of 26 probes (i.e., 77%) across the baseline and intervention conditions. The mean agreement was 100% both on the PSF and NWF measure. Steph’s IOA data were collected on 22 out of 28 probes (i.e., 79%) across the baseline and intervention conditions. The mean agreement on the PSF measure was 99% (range=88%-100%) and the mean agreement on the NWF measure was 88.58% (range=90%-100%). The IOA data for Henry were collected on 20 out of 26 probes (i.e., 77%) across the baseline and intervention conditions. The mean agreement on PSF measure was 96.94% (range=80%-100%) and the mean agreement on NWF measure was 97.45% (range=84%-100%). To summarize, the total IOA for all participant were collected on 62 out of 80 probes (i.e. 78%) across the baseline and intervention conditions. The mean agreement on PSF measure was 98.65%
(range=80%-100%) and the mean agreement on NWF measure was 99.01% (range=84%-100%).

<table>
<thead>
<tr>
<th>Student</th>
<th>Collected/Total</th>
<th>PSF Measure</th>
<th>NWF Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sessions   %   Mean % Range % Mean % Range %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracy</td>
<td>20/26 77   100 N/A</td>
<td>100 N/A</td>
<td></td>
</tr>
<tr>
<td>Steph</td>
<td>22/28 79   99 88-100</td>
<td>99.58 90-100</td>
<td></td>
</tr>
<tr>
<td>Henry</td>
<td>20/26 77   96.94 80-100</td>
<td>97.45 84-100</td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td>62/80 78   98.65 80-100</td>
<td>99.01 84-100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1: Interobserver agreement for DIBELS PSF and NWF measures
IOA on Pretest and Posttest CBM

IOA on pretest and posttest CBM was conducted in the intervention conditions. The number of data points for participants varied because each of them received different number of lessons during intervention. Results of IOA are shown in Table 4.2 based on the pretest and posttest CBM measures.

A total of 25 lessons were instructed during Tracy’s intervention, and IOA data for Tracy were collected on 21 out of 25 pretests (i.e., 84%) and 21 out of 25 posttests (i.e., 84%). The mean agreement on pretest measures was 99.52%, and the mean agreement on posttest measures was 100%. A total of 23 lessons were instructed to Steph during intervention condition. The agreement data were collected on 18 out of 23 pretests (i.e., 78.3%) and 18 out of 23 posttests (i.e., 78.3%). For Steph, the mean agreement on both pretest and posttest measures was 100%. A total of 21 lessons were instructed to Henry during intervention. IOA data for Henry were collected on 16 out of 21 pretests (i.e., 76.2%) and 16 out of 21 posttests (i.e., 76.2%). Data indicated a 98.8% agreement on pretest measure and a 99.4% on posttest measure.
<table>
<thead>
<tr>
<th>Student</th>
<th>Pretest CBM</th>
<th></th>
<th>Posttest CBM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Collected/Total</td>
<td>Mean % Agreement</td>
<td>Collected/Total</td>
<td>Mean % Agreement</td>
</tr>
<tr>
<td></td>
<td>Sessions</td>
<td>%</td>
<td>Sessions</td>
<td>%</td>
</tr>
<tr>
<td>Tracy</td>
<td>21/25</td>
<td>84</td>
<td>99.5</td>
<td>21/25</td>
</tr>
<tr>
<td>Steph</td>
<td>18/23</td>
<td>78.3</td>
<td>100</td>
<td>18/23</td>
</tr>
<tr>
<td>Henry</td>
<td>16/21</td>
<td>76.2</td>
<td>98.8</td>
<td>16/21</td>
</tr>
<tr>
<td>Combined</td>
<td>55/69</td>
<td>79.5</td>
<td>99.4</td>
<td>55/69</td>
</tr>
</tbody>
</table>

Table 4.2: Interobserver agreement for pretest and posttest CBM

Procedural Integrity

The researcher, serving as the second observer, collected procedural integrity data on 79.71% of the total instructional sessions across participants (i.e., 55 out of 69 sessions). The high percent of the collection for procedural integrity was because the
phonological awareness instruction was more appropriate if being implemented by native
English speaker. Since the researcher is an international student, she was along with the
interventionist of the study in the school every day. The data reflected the varied numbers
of lessons taught to each participant. A procedural integrity checklist was used to check
whether the intervention was implemented as planned. Integrity data with the percentage
of accuracy according to each participant are presented in Table 4.3. Tracy was observed
on 21 of 25 instructional sessions (i.e., 84%) and obtained a mean of accuracy of 99.4%.
Steph was observed on 18 of 23 instructional sessions (i.e., 78.3%) and resulted in a
mean of accuracy of 98.6%. Henry was observed on 16 of 21 instructional sessions (i.e.,
76.2%) and resulted in a mean of accuracy of 100%.
<table>
<thead>
<tr>
<th>Student</th>
<th>Collected/Total</th>
<th>Accuracy %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sessions</td>
<td>%</td>
</tr>
<tr>
<td>Tracy</td>
<td>21/25</td>
<td>84.0</td>
</tr>
<tr>
<td>Steph</td>
<td>18/23</td>
<td>78.3</td>
</tr>
<tr>
<td>Henry</td>
<td>16/21</td>
<td>76.2</td>
</tr>
<tr>
<td>Combined</td>
<td>55/69</td>
<td>79.5</td>
</tr>
</tbody>
</table>

Table 4.3: Procedural integrity data for the participants

Student Performances on Dependent Variables

Individual student data were collected before, after, and throughout the study. The pretest and posttest measures in this study included the Letter Identification subtest and Word Attack subtest of *the Woodcock Reading Mastering Test-Revised* (1987), Rhyming Test in *Get it Got it Go* (University of Minnesota, 2003), and phoneme-blending test as well phoneme-segmentation test designed by Laughon (1989).
The progress monitoring throughout the study for the dependent variables were the DIBELS Phoneme-Segmentation Fluency (PSF) measures and Nonsense Word Fluency (NWF) measures. In addition, during intervention the curriculum-based measures were implemented, assessing the effectiveness of daily lessons which consisted of phoneme-blending, phoneme-segmentation, letter-sound relationship (i.e., phonemic awareness) and word reading.

Each participant received 5 or 6 PSF and NWF probes using DIBELS (1 probe per day) during the baseline condition and one probe every 3 days during the intervention condition. The results for each student are reported in terms of their performance on (1) pretest and posttest on Letter Identification of the Woodcock Reading Mastery Test-Revised (1987), (2) pretest and posttest on Word Attack of the Woodcock Reading Mastering Test-Revised (1987), (3) pretest, midpoint, and posttest on Rhyming test in Get it Got it Go (University of Minnesota, 2003), (4) pretest and posttest on phoneme-blending test designed by Laughon (1989), (5) pretest and posttest on phoneme-segmentation test designed by Laughon (1989). (6) DIBELS PSF, (7) DIBELS NWF, (8) CBM during intervention, (9) maintenance test, (10) generalization test. Results of pretests of posttest measures were summarized in Table 4.4, and results of DIBELS PSF and NWF were graphed in Figure 4.2.
Student 1: Tracy

Baseline data for each participant was collected prior to phonological awareness instruction. Tracy was the first participant who entering the intervention condition immediately after 5 probes in the baseline condition. Tracy participated in a total of 25 lessons throughout the study.

Pretest and Posttest Measures

Woodcock Reading Mastering Test-Revised. The subtests of Letter Identification and Word Attack were used before the beginning and after the completion of the phonological awareness instruction. Results were described below, and summarized in Table 4.4. (a) Letter Identification. On the pretest measure, Tracy identified 32 items and scored the highest among all the participants. The items on this test consisted of both capital and lowercase letters. Tracy’s grade equivalent score in pretest of 1.0 and the age equivalent level was 6 years and 4 months. In addition, the percentile rank of the pretest measure was 70. Tracy identified 35 items on the posttest. The grade equivalent level was 1.3, and the age equivalent was 6 years and 8 months. In addition, the percentile rank is 81%. (b) Word Attack. Tracy made slight gains on the posttest measures of Word Attack in comparison to the performance on the pretest. On the pretest measure, Tracy was unable to read any of the nonsense word items correctly. The grade equivalent level
K. \( 0 \) \(^{33} \), and the age equivalent level \( 5-0 \) \(^{33} \). In addition, the percentile rank was 33%. On the post-test measure, Tracy scored one item after intervention. The grade equivalent level is 1.0, and the age equivalent level was 6 years and 8 months. Even though she only answered one item correctly, the percentile rank increased from 33% to 62%.
<table>
<thead>
<tr>
<th>Student</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Pre</th>
<th>Mid</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracy</td>
<td>Sc 32</td>
<td>GE 1.0</td>
<td>PR 70</td>
<td>Sc 35</td>
<td>GE 1.3</td>
<td>PR 81</td>
<td>0 K. 32</td>
<td>GE 1.0</td>
<td>Sc 62</td>
<td>GE 2</td>
<td>PR 5</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Steph</td>
<td>0 K. 3</td>
<td>5</td>
<td>4 K. 15</td>
<td>0 K. 33</td>
<td>1</td>
<td>1.0</td>
<td>62</td>
<td>2</td>
<td>7</td>
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<tr>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Henry</td>
<td>24 K.3</td>
<td>46</td>
<td>32 1.0</td>
<td>72 K. 33</td>
<td>0</td>
<td>K. 33</td>
<td>0 K. 33</td>
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<td>9</td>
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Table 4.4: Results of pretest and posttest measures for the participants
Rhyming Test in *Get it Got it Go*. Tracy made some gains on posttest measure in rhyming compared to the zero level on the pretest. On the pretest measure, Tracy correctly identified 0 item, while typical developing children of the same age correctly identified 14 items correct in March, which was shown in Figure 4.1. The aim line was the visual representation of the desired rate of growth. The gap between the aim line and Tracy’s performance was 14 items. After one-month phonological awareness instruction, the number of correct items identified by Tracy was 7 and the aim line in mid-April was 15. The gap between Tracy and typically developing children decreased to 8. On the post-test measure in mid-May, Tracy identified 8 items in comparison to the aim line of 16 correct items. The gap of performances between Tracy and typically developing children remained 8.
Figure 4.1: Results of Rhyming test in *Get it Got it Go* for Tracy

*Phoneme-Blending Test designed by Laughon (1989).* On this test, the interventionist pronounced each phoneme of a word in isolation (two phonemes/second), and asked Tracy to blend all phonemes to pronounce the word. One point was given for each phoneme correctly produced. The total possible score was 54, and Tracy only responded correctly in 1 word and got 2 points on the pretest measure. After intervention, she produced 5 correct phonemes (scored five points).
Phoneme-Segmentation Test designed by Laughon (1989). Tracy tried to listen to a word composed of 2 to 5 phonemes and then say each phoneme in the correct order. The total possible score was 51, and Tracy got only 1 point on the pretest measure. After intervention, she had slight improvement, getting 2 more points.

Measures during Intervention

PSF. Tracy’s baseline data showed that her responding of phoneme segmentation ranged from 0-2 with a mean of 1 phoneme per minute. Visual inspection of Tracy’s data showed a gradual upward slope in the intervention condition compared to the responding in the baseline condition (see Figure 4.2). Intervention data initially did not show an increase; however, from the third intervention probe there was an increase in scores. Tracy produced a mean of 4.125 phonemes per minutes with the range between 0 and 8 in the intervention condition.

NWF. Tracy’s baseline data showed that she was able to read some letter sounds, but the number was limited. In the baseline condition Tracy identified a mean of 5.8 letter sounds per minutes with the range between 2 and 9. She always correctly identified and read the letter sounds /c/, /k/, /m/, and /z/. She sometimes correctly identified the letter /j/, /o/, and /s/. Tracy’s data showed a steep upward trend after the second intervention probe (see Figure 4.2), and the performance in PSF was high and stable until the end of the
study. Tracy identified a mean of 17.13 phonemes per minutes (range= 9-22) in the intervention condition.
Figure 4.2: Results of DIBELS PSF and NWF subtests for all participants
Curriculum-based measures (CBM), including pretest and posttest, were implemented daily immediately before and after instruction. The pretest measure, served as the “daily baseline” and was compared to the posttest measure to determine if the phonological awareness instruction was effective on pre-reading skills. Results of the pretests showed an average score of 49.2% (range=0%-100%), and the average score on posttest measures was 81.4% (range= 44%-100%) (see Figure 4.3).

(a) Rhyming: Lesson 1, 2 and 3 were warm-up activities focusing on rhyming. Tracy did not perform very well on the pretest measure, and the mean percent of correct answers was 22.33% (0-38%). However, Tracy’s had an increase in score in posttest measure and reached 100% in lesson 3. The mean percent of correct answers in posttest measures was 83.33% (range=60%-100%).

(b) Phoneme blending: Lesson 4, 5, 7, 12, and 17 were phoneme-blending activities including blending words divided into 2 parts (lesson 4) and blending words with individual phonemes (lesson 5, 7, 12, and 17). Each time when the focus of the lesson was phoneme blending, the scores of pretest measure were higher than the scores of other lessons. The mean of correct percent on the pretest measures was 84.8% (range=77%-100%), and on the posttest measures was 97% (range=88%-100%).

(c) Phoneme segmentation-first sound: Lesson 6, 8, 13, and 18 were
phoneme-segmentation tasks focusing on first sound. These lessons seemed much more
difficult for Tracy. The mean of correct percent on the pretest measures was 31.75%
(range=0-60%), and on the posttest measures was 52.25% (range=25%-80%) with an
increasing trend. Tracy got 80% correct in the last lesson (lesson 18). (d) Phoneme
segmentation-last sound: Lesson 9, 14, and 19 were phoneme-segmentation tasks
focusing on last sound. These lessons were difficult for Tracy. Tracy’s mean of correct
percent on the pretest measures was 10.33% (range=0-20%), and on the posttest measures
was 68% (range=50%-91%) with an increasing trend and ended 91% in the last lesson
(lesson 19). (e) Phoneme segmentation-middle sound: Lesson 10, 15, and 20 were
phoneme-segmentation tasks focusing on the middle sound. These lessons were difficult
for Tracy. Tracy’s mean of correct percent on the pretest measures was 23.33%
(range=0-38%), and on the posttest measures was 70% (50%-82%) with an increasing
trend ended at 82% in the last lesson (lesson 20). (f) Letter-sound relationship: Lesson 11,
16, and 21 were tasks in letter-sound relationship. Actually letter-sound relationship was
already contained in phoneme-blending and phoneme-segmentation lessons, but the
letter-sound relationship was systematically introduced only in only in lesson 11, 16, and
21. Tracy performed much better in these lessons. Her mean of correct percent on the
pretest measures 63% (range=38%-77%), and on the posttest measures was 96.67%
(range=82%-96%). (g) Review session-Letter-sound relationship: Lesson 22, 23, 24, and 25 were review sessions to strengthen the learned letter-sound relationship. Tracy’s mean of correct percent on the pretest measures was 81.25% (range=71%-94%), and on the posttest measures was 96% (range=91%-100%).
Figure 4.3: Results of CBM pretest and posttest for Tracy
**Maintenance Probes**

In this study, maintenance probes were administered every 8 lessons during the intervention conditions to examine if the participant was still able to correctly respond the correct items in the previous CBM. There were 3 maintenance probes, and the correct percent of Tracy in these probes was 100%, 100%, and 93%.

**Generalization Probe**

In the generalization probe administered at the conclusion of the study, the nonsense words composed of learned letter sounds were developed by the researcher. In the probe, Tracy correctly produced all separate letter sounds in the words except for /c/ sound. The number of letter sounds correctly produced was 23. However, she failed to blend the letter sounds together to read the whole word.

**Student 2: Steph**

Baseline data for each participant was collected prior the phonological awareness instruction. Steph was the second participant to enter the intervention condition immediately after the effects of intervention on Tracy were demonstrated. Steph participated in a total of 23 lessons throughout the study.
Pretest and Posttest Measures

Woodcock Reading Mastering Test-Revised. (a) Letter Identification. Steph did not correctly identify any item and scored the lowest among all the participants in comparison to Tracy’s 32 items and Henry’s 24 items. It seemed Steph fell behind other participants very much in letter identification. The grade equivalent level of Steph was K.0°, and the age equivalent level was 5-0°. In addition, the percentile rank was 5. After phonological awareness instruction, Steph’s improvement in identifying letters was still limited. He identified only 4 items on the posttest. The grade equivalent level was K.0°, and the age equivalent level was 5-0°. In addition, the percentile rank is 15%. (b) Word Attack. Steph made slight gains on the Word Attack posttest in comparison to the performance on the pretest. On the pre-test measure, Steph could not read any of the nonword items correctly and scored 0. The grade equivalent level was K.0°, and the age equivalent level was 5-0°. In addition, the percentile rank was 33%. On the post-test measure, Steph scored one item after intervention. The grade equivalent level was 1.0, and the age equivalent level was 6 years and 8 months. Although Steph’s progress was only one item, but the percentile rank increased from 33% to 62%. Results were summarized in Table 4.4.
Rhyming Test in Get it Got it Go. Steph made some gains on Rhyming test. On the pre-test measure, Steph identified 1 item correctly and typical developing children of the same age identified 12 items correct in March, which was shown in Figure 4.4. The aim line was the visual representation of the desired rate of growth. The gap between the aim line and Steph’s performance was 11 items. After one-month phonological awareness instruction, the number of correct items identified by Steph was 8 and aim line in mid-April was 13. The gap between Steph’s and typically developing children decreased to 5. On the post-test measure in mid-May, Steph identified 9 items in comparison to the aim line of 14 correct items. The gap decreased to 5. By visual inspection of the trend line of Steph, the trend got closer to the aim line in high rate. Steph may progress and catch up to typically developing children soon if he continues to have access to optimal learning opportunities. Results of rhyming test were shown on Figure 4.4.
Figure 4.4: Results of Rhyming test in *Get it Got it Go* for Steph

*Phoneme-Blending Test designed by Laughon (1989).* One point was given for each phoneme correctly produced in the word provided. The total possible score was 54, and Steph only responded correctly in 1 word and got 2 points on the pretest measure. After intervention, he produced 7 correct phonemes (scored seven points).

*Phoneme-Segmentation Test designed by Laughon (1989).* Steph tried to listen to a word composed of 2 to 5 phonemes and then say each phoneme in the correct order. The total possible score was 51, and Steph got only two points on the pretest measure. After intervention, he got seven points.
Measures during Intervention

PSF. Steph’s baseline data showed that he was able to segment phonemes in some level. His responding of phoneme segmentation ranged from 5-7 with a mean of 5.83 phonemes per minute. Visual inspection of Steph’s data showed a gradual ascending slope in the intervention condition compared to the responding in the baseline condition (see Figure 4.2). However, the data were not stable. A descending trend was shown from the third intervention probe and the trend ascended again until the fifth intervention probe. Then, the trend went downward again. Steph produced a mean of 11.38 phonemes per minutes with the range between 10 and 14 in the intervention condition, which demonstrated improvement during phonological awareness instruction.

NWF. Steph’s baseline data showed that he was able to read some letter sounds, but the number was limited. In the baseline condition Steph identified a mean of 0.5 letter sounds per minutes with the range between 0 and 1. Steph could only correctly identified and read the letter sounds /j/ and /t/. Steph’s data showed a gradual upward trend initially but followed by a decrease in scores from the third intervention probe (see Figure 4.2). The trend was not stable; it ascended from the fourth intervention probe and descended immediately. At the end of the intervention, a gradual ascending trend was shown again.
Steph identified a mean of 1.5 phonemes per minutes with the range between 1 and 4 in the intervention condition.

CBM. Steph received 23 out of 25 lessons during the intervention condition except for 2 review sessions. Steph made gains in posttest measure compared to the performance in pretest measure. The mean of correct percent on the pretest measures was 41.30% (range=0-100%), and the mean of correct percent on the posttest measures was 74.83% (range=22%-100%) (see Figure 4.3). Details of the results were described below.

(a) Rhyming: Steph did not perform very well on the pretest measures of Lesson 1, 2, and 3, and the mean of correct percent was 29% (range=0-70%). However, the increase was shown on the posttest measures and the mean of correct percent was 90.67% with the range between 86%-100%. (b) Phoneme blending: Steph did very well in phoneme-blending tasks of Lesson 4, 5, 7, 12, and 17. The mean of correct percent on the pretest measures was 93.4% (range=67%-100%), and the mean of correct percent on the posttest measures was 100%. (c) Phoneme segmentation-first sound: First sound segmentation in Lesson 6, 8, 13, and 18 seemed not difficult for Steph. The mean of correct percent on the pretest measures was 55.25% (range=33%-80%), and Steph correctly responded 100% in all posttests except for lesson 18. The mean of correct percent on the posttest measures was 93.75% (range=75%-100%). (d) Phoneme
segmentation-last sound: Last sound segmentation Lesson 9, 14, and 19 was difficult for Steph. He correctly responded only 10.33% (range=0-17%) on the pretest measures. Even after intervention, Steph’s mean of correct percent was 59% (range=22%-88%). (e) Phoneme segmentation-middle sound: Middle sound segmentation was also difficult for Steph even after phonological awareness instruction. However, compared to the pretest measures, he had some improvement. In Lesson 10, 15, and 20, Steph’s correctly responded 18% (range=0-43%), and the mean of correct percent on the posttest measures was 56.33% (25%-78%). (f) Letter-sound relationship: Steph’s improvement in Lesson 11, 16, and 21 was limited. Steph performed lowest among all participants. His mean of correct percent on the pretest measures was only 8.33% (range=0-13), and on the posttest measures was 41%. (g) Review session-Letter-sound relationship: Steph only received two review sessions, Lesson 22 and 23. Steph did not perform well in these lessons but had slight improvement in posttest measures compared to pretest measures. Steph’s mean of correct percent on the pretest measures was 23.5% (range=23%-24%), and on the posttest measures was 51% (range=42%-60%).
Figure 4.5: Results of CBM pretest and posttest for Steph
**Maintenance Probes**

In this study, maintenance probes were administered every 8 lessons during the intervention conditions to examine if the participant was still able to correctly respond the correct items in the previous CBM. There were 3 maintenance probes, and the correct percent of Steph in these probes was 100%, 79%, and 36%.

**Generalization Probe**

Steph’s production of letter sounds was limited. The letter sounds he could correctly identify and produce were /h/, /t/, and /o/, and the number of letter sounds correctly produced was 4. Steph’s failures in identifying most of letter sounds blocked him from blending phonemes to read the whole words.

**Student 3: Henry**

Baseline data for each participant was collected prior to phonological awareness instruction. Henry was the last participant to receive the intervention thirdly immediately after the effects of the intervention were demonstrated on Steph. Henry participated in a total of 21 lessons throughout the study.

**Pretest and Posttest Measures**

*Woodcock Reading Mastering Test-Revised.* (a) *Letter Identification.* On the pretest measure, Henry was able to identify or name 24 items. The grade equivalent score
of K.3, and the age equivalent level was 5 years and 3 months. In addition, the percentile rank was 46%. Henry identified 32 items on the posttest. On the posttest measure, the grade equivalent level was 1.0, and the age equivalent was 6 years and 4 months. In addition, the percentile rank was 72%. (b) Word Attack. Henry’s scores in Word Attack had no improvement after phonological awareness instruction. Both on the pretest measure and the posttest measure, Henry could not read any of the nonsense word items correctly. The grade equivalent level was K.0 and the age equivalent level was 5-0. Moreover, the percentile rank was 33%.

**Rhyming Test in Get it Got it Go.** Henry’s performance in rhyming was highest among all participants both on the pretest and posttest measures. On the pretest measure, Henry identified 7 items correctly and the aim for typical developing children of the same age was 13 items in March, which was shown in Figure 4.6. The aim line was the visual representation of the desired rate of growth. The gap between the aim line and Henry’s performance was 6 items. After one-month phonological awareness instruction, the number of correct items identified by Henry was 12 and aim line in mid-April was 14. The gap between Henry and typically developing children decreased to 2. On the post-test measure in mid-May, Henry identified 15 items, which was the same as the number in the aim line. That is, Henry’s performance in rhyming caught up to that of
typically developing children. By visual inspection of the trend line of Henry, the progress was promising. Henry might perform better than the aim line if he continued to receive the instruction.

Figure 4.6: Results of Rhyming test in Get it Got it Go for Henry
Phoneme-Blending Test designed by Laughon (1989). One point was scored for each phoneme correctly produced. The total possible score was 54, and Henry scored zero on the pretest measure. After intervention, his score was up to 9 points.

Phoneme-Segmentation Test designed by Laughon (1989). The total possible score was 51, and no item was responded correctly by Henry on the pretest measure. However, Henry made evident gains after intervention compared to the performance on the pretest measure. He got 17 points on the posttest measure.

Measures during Intervention

PSF. Henry’s baseline data showed that his responding of phoneme segmentation ranged from 0-6 with a mean of 4.4 phonemes per minute. Visual inspection of Henry’s data showed a steep upward slope in the intervention condition compared to the responding in the baseline condition (see Figure 4.2). The ascending trend of the intervention data was stable compared to the performance of other participants during intervention. Henry produced a mean of 12.57 phonemes per minutes with the range between 6 and 22 in the intervention condition.

NWF. Henry’s baseline data showed that he was able to read some letter sounds, but the number was limited. In the baseline condition Henry identified a mean of 4.6 letter sounds per minutes with the range between 0 and 6. He always correctly identified
and read the letter sounds /a/, /f/, /m/, and /o/ each time when she saw these letters. He sometimes correctly identified the letter /j/ and /s/. Henry’s data showed a steep upward trend immediately when the phonological awareness instruction was introduced (see Figure 4.2). He identified a mean of 16.43 phonemes per minutes (range= 9-23) in the intervention condition.

CBM. Henry received 21 lessons during the intervention condition except for 4 review sessions. Henry made gains on the posttest measures compared to the pretest measures. The mean of correct percent on the pretest measures was 68% (range=33%-100%), and on the posttest measures was 93.05% (range=75%-100%) on the posttest (see Figure 4.7). Details of the results were described below.

(a) Rhyming: The mean of correct percent on the pretest measures in Lesson 1, 2 and 3 was 61% (range=50%-83%). Henry’s made gains on the posttest measures. The mean of correct percent was 89.33% with the range between 75%-100%. (b) Phoneme blending: Henry did well in phoneme-blending lessons, including pretest and posttest measures. The mean of correct percent in Lesson 4, 5, 7, 12, and 17 was 84.6% (range=70%-100%), and on the posttest measures was 98.2% (range=91%-100%). (c) Phoneme segmentation-first sound: First sound segmentation in Lesson 6, 8, 13, and 18seemed not difficult for Henry. The mean of correct percent on the pretest measures
was 74% (range=64%-83%), and on the posttest measures was 97% (range=88%-100%). He correctly responded 100% in all posttests except for lesson 6. (d) Phoneme segmentation-last sound: Last sound segmentation in Lesson 9, 14, and 19 seemed a little difficult for Henry. The mean of correct percent on the pretest measures was only 67.33% (range=50%-92%), and on the posttest measures was 87.67% (range=75%-100%). (e) Phoneme segmentation-middle: Middle sound segmentation in Lesson 10, 15, and 20 was difficult for Henry, but the improvement was shown after intervention. The mean of correct percent on the pretest measures was 47.67% (range=33%-60%), and on the posttest measures was 91.67% (83%-100%). (f) Letter-sound relationship: In Lesson 11, 16, and 21, the mean of correct percent on the pretest measures was only 60.33% (range=53%-69%), and on the posttest measures was 89.67% (range=81%-92%).
Figure 4.7: Results of CBM pretest and posttest for Henry
**Maintenance Probes**

In this study, maintenance probes were administered every 8 lessons during the intervention conditions to examine if the participant was still able to correctly respond the correct items in the previous CBM. There were 3 maintenance probes, and the correct percent of Henry in these probes was 83%, 88%, and 94%.

**Generalization Probe**

Henry correctly produced all separate letter sounds in the words except for /e/ and /i/ sound. The number of letter sounds he correctly produced was 32. Moreover, he was able to correctly blend the letter sounds to read 2 untrained words.

In order to analyze all the assessments of this study based on the pre-reading skills, all assessments were categorized into three groups: phoneme-blending (Table 4.5), phoneme-segmentation (Table 4.6), and letter-sound relationship and word reading (Table 4.7).
<table>
<thead>
<tr>
<th>Student</th>
<th>Pretest of CBM</th>
<th>Posttest of CBM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>Tracy</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Steph</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Henry</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Mean of</td>
<td>1.33</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 4.5: Results of measures on phoneme-blending skills for the participants
<table>
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<th>Phile</th>
<th>Henry</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSF</td>
<td>1</td>
<td>5.83</td>
<td>4.4</td>
</tr>
<tr>
<td>Inter-</td>
<td>4.13</td>
<td>11.38</td>
<td>12.57</td>
</tr>
<tr>
<td>ven-</td>
<td>(0.89)</td>
<td>(0.69)</td>
<td>(2.18)</td>
</tr>
<tr>
<td>tion (num-</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>ber)</td>
<td>2</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Mean</td>
<td>31.75</td>
<td>55.25</td>
<td>74</td>
</tr>
<tr>
<td>Mean</td>
<td>0-60</td>
<td>33-80</td>
<td>64-83</td>
</tr>
<tr>
<td>(SD)</td>
<td>52.2</td>
<td>93.7</td>
<td>97</td>
</tr>
<tr>
<td>(SD)</td>
<td>10.33</td>
<td>75-10</td>
<td>50-9</td>
</tr>
<tr>
<td>Pretest</td>
<td>0-20</td>
<td>0-17</td>
<td>0-80</td>
</tr>
<tr>
<td>Correct</td>
<td>68</td>
<td>59</td>
<td>67.33</td>
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<tr>
<td>Range</td>
<td>0-91</td>
<td>22-88</td>
<td>50-9</td>
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<tr>
<td>Correct</td>
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<td>18</td>
<td>29.33</td>
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<td>Percent</td>
<td>0-38</td>
<td>0/43</td>
<td>71.56</td>
</tr>
<tr>
<td>Percent</td>
<td>70</td>
<td>72.6</td>
<td>72.6</td>
</tr>
<tr>
<td>Posttest</td>
<td>50-82</td>
<td>75-10</td>
<td>83-10</td>
</tr>
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Table 4.6: Results of measures on phoneme-segmentation skills for the participants
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<th>Woodcock Reading Mastery</th>
<th>CBM</th>
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<tr>
<td></td>
<td>Baseline (Mean)</td>
<td>Intervention (Mean)</td>
<td>Pretest</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>(SD)</td>
<td>Sc</td>
</tr>
<tr>
<td>Tracy</td>
<td>5.8 (2.32)</td>
<td>17.13 (4.85)</td>
<td>K.0³³</td>
</tr>
<tr>
<td>Steph</td>
<td>0.5 (0.5)</td>
<td>1.5 (1.31)</td>
<td>K.0³³</td>
</tr>
<tr>
<td>Henry</td>
<td>4.6 (2.1)</td>
<td>16.43 (5.29)</td>
<td>K.0³³</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>33</td>
<td>50.72</td>
</tr>
</tbody>
</table>

Table 4.7: Results of measures on letter-sound relationship and word reading for the participants
Social Validity Measurement

Social validity measurement is an important aspect of evaluating research in applied behavior analysis (Cooper, Heron, & Heward, 2007). In this study, teachers and parents were asked to complete consumer satisfaction questionnaires to determine the appropriateness and usefulness of the target skills, the appropriateness of the procedures and the outcomes of the study. Participants, due to their young ages, were interviewed to obtain their opinions about the phonological awareness instruction and whether this one-on-one basis instruction had helped them learn pre-reading skills.

Teacher Satisfaction Questionnaire

At the completion of the study, the preschool classroom teacher was given the teacher form of the social validity questionnaire (see Appendix F). The items on the questionnaire were designed based on the Post-Intervention Acceptability and Importance of Effects Survey designed by Musti-Rao (2005). However, some revisions were made because the classroom teacher was not the interventionist of the study. She still had opportunities such as the circle time to observe the participants’ pre-reading skills. The teacher’s responses are shown in Table 4.8.

Overall, the preschool classroom teacher had “strong agreement” in questions 1 though 6 except for question 4. Particularly, she “strongly agreed” (rating=5) that the
phonological awareness instruction (a) supplemented her current classroom instruction, (b) taught important skills, (c) will have lasting positive effects, (d) is one she will permit to continue if taught by someone else, (f) is one she will recommend to others. In Question 4, regarding whether the teacher would use the instruction in the future, she only marked “agreed” (rating=4) rather than “strongly agreed”. The reason of the feedback may be because the classroom teacher had limited information about how the instruction was implemented because she was not involved in the implementation of the instruction. The study was conducted in the separate room on one-on-one basis by a trained native English speaker. Compared to the feedback of items 5 and 6, the classroom teacher strongly agreed” that she would permit to continue the instruction if taught by “someone else” and would recommend this instruction to others. Maybe if sufficient training is provided to allow the teacher to be familiar with the procedures of the instruction, she will be more willing to use by herself in the future.

When asked to rate the effectiveness of the intervention, the teacher indicated that the intervention was “very effective” (rating=5) for all participants, Tracy, Steph, and Henry. In response to the open-ended question, asking what changes she found in the participants’ reading ability compared to the beginning of the school year, the teacher expressed the faster and more accurate response of the participant during letter-related
activities during circle time, including identifying the beginning sound of a word (auditory), pointing at specific letters (visual) within the words. Additional anecdotes the teacher would like to share were that all participants were able to recognize the letters in their name in other words. For example, Tracy identified the /t/ sound in “Teddy Bear” was the same as the first sound of her name. Moreover, the participants extended their interests to recognize letters which were not in their name. The teacher also mentioned that during the IEP meeting the participants’ parents were very supportive and impressed with the progress of their children.
The phonological awareness instruction:

1. Supplemented my current classroom instruction ✓
2. Taught important skills ✓
3. Will have lasting positive effects ✓
4. Is one I will use in the future when needed ✓
5. Is one I will permit to continue if taught by someone else ✓
6. Is one I will recommend to others ✓

In your opinion, rate the effectiveness of the intervention for:

<table>
<thead>
<tr>
<th>Student</th>
<th>Very Effective</th>
<th>Moderately Effective</th>
<th>Neutral</th>
<th>Somewhat Effective</th>
<th>Not at all Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1-Tracy</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 2-Steph</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 3-Henry</td>
<td>✓</td>
<td></td>
<td></td>
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</tbody>
</table>

What are some changes you find in your students’ reading ability compared to the beginning of the school year? (For example, their responding in circle time)

“Faster and more accurate response to letter-related activities including first sound identification when orally presented a word, and specific letters identification (in print) within the words”

Additional anecdotes or comments you would like to share:

“All participants recognize the letters in their names when they see the same letters in other words. In addition, all participants have begun to recognize all the letters, not only just letters composed of their name.” “During interaction with parents in the IEP meeting at the end of the school year, the parents mentioned that they are very supportive and impressed with the results of the study and the influence on their children.”

Table 4.8: Results of social validity questionnaire-teacher form
Parent Satisfaction Questionnaire

The parents of each participant were provided with a copy of the parent form of social validity questionnaire along with a cover letter explaining the purpose of the questionnaire (see Appendix G). The researcher received all questionnaires completed by parents with 95.8% response rate. Among all 8 questions in the questionnaire, only 1 parent did not answer the last question: additional anecdotes you would like to share. This may be because the answers to question 8 and question 7 might overlap and the parent might respond all the descriptive feedback in question 7 already.

The parents’ responses to items on the questionnaire are presented in Table 4.9. The parents were asked to respond to six questions using a 5-point Likert Scale and two open-ended questions. The parent responses to these questions were weighted on a scale from 1 to 5 and the mean rating for each response was calculated to determine the mean response.

Parent 1. Tracy’s parent returned the parent questionnaire after the IEP meeting. Parent 1 marked “strongly agreed” on 5 out of 6 questions, including the instruction was effective in preparing the child to future word reading, Tracy became more sensitive and interested in letters and words around her, she tried to identify letter sounds when seeing a new word, and they were glad Tracy had participated in this study and would like her continue receiving phonological awareness instruction next school year. In response to
whether the phonological awareness instruction was effective in teaching the child letter sounds, Parent 1 only marked “agreed”.

*Parent 2.* Steph’s parent returned the parent questionnaire after the IEP meeting. Parent 2 was very glad and hoped that he could be involved in the same or similar study in the next school year. The parent found Steph increased his interests towards letter sounds and words. He not only started to recognize the letter sounds but also wanted to know the word meanings when seeing a new word. The parent marked “strongly agreed” in all 5-point Likert Scale questions, including (a) I feel the phonological awareness instruction has been effective in teaching my child letter sounds, (b) I feel the phonological awareness instruction has been effective in preparing my child to future word reading, (c) I find my child becomes more sensitive and interested in letters and words around him, (d) I find my child tries to identify letter sounds when seeing a new word, (e) I am glad my child participated in the phonological awareness study this semester, and (f) I would like my child to continue receiving the phonological awareness instruction next school year.

*Parent 3.* Henry’s parents brought back the completed parent questionnaire when they drove the child to school in the morning. They had positive feedback on the 5 of 6 items in the questionnaire. Although Henry’s parents only marked “agreed” that the
child became more sensitive and interested in letters and words around him, they did “strongly agreed” that the phonological awareness instruction was effective in teaching the child letter sounds and in preparing Henry to future word reading, and Henry tried to identify letter sounds when he sees a new word. They also “strongly agreed” that they were glad Henry’s participation in the study and would like him to continue receiving the instruction next school year. They mentioned that since participating in this study, Henry started to sound words out which he never did before. Also, Henry’s speech improved greatly.
<table>
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<tr>
<th>Questions</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>1. I feel the phonological awareness instruction has been effective in teaching my child letter sounds</td>
<td>P2, P3</td>
<td>P1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I feel the phonological awareness instruction has been effective in preparing my child to future word reading</td>
<td>P1, P2, P3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I find my child becomes more sensitive and interested in letters and words around him (her)</td>
<td>P1, P2</td>
<td>P3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I find my child tries to identify letter sounds when he (she) sees a new word</td>
<td>P1, P2, P3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I am glad my child participated in the phonological awareness program this semester</td>
<td>P1, P2, P3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6. I would like my child to continue receiving the phonological awareness instruction next school year</td>
<td>P1, P2, P3</td>
<td></td>
<td></td>
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<tr>
<td>7. What are some changes you see in your child’s reading ability compared to the beginning of the school year?</td>
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</tr>
<tr>
<td>P1: Tracy always finds the letters in her names. Tracy may say that her classmates Terri was absent, and finds the initial sound of her name was the same as Terri. Sometimes she sounds out letters automatically.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>P2: Steph starts to recognize the sounds of letters and would like to know the meaning of the word he has seen.</td>
<td></td>
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</tr>
<tr>
<td>P3: During and after the intervention, Henry has started to sound words out. He never did this before!</td>
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<td></td>
</tr>
<tr>
<td>8. Additional anecdotes or comments you would like to share:</td>
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<td>P1: none</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>P2: Steph does benefit from this intervention, we would like him to involve in this study in the near future.</td>
<td></td>
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</tr>
<tr>
<td>P3: Henry’s speech has improved greatly since participating in this study!</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table 4.9: Results of social validity questionnaire-parent form
Overall, the mean responses were shown in Table 4.10 with the range from “agree” to “strongly agree”. That is, all parents whose children were involved in this study responded in agreement that phonological awareness instruction was effective in teaching their children letter sounds and in preparing them to future word reading. The parents found their children became more sensitive and interested in letters and words around them, and tried to identify letter sounds when seeing a new word. All parents strongly agreed that they were glad their children participated in this phonological awareness program this semester, and would like their children had opportunities to receive the instruction next school year.

<table>
<thead>
<tr>
<th>Item</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>Mean</th>
<th>Response Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4.7</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>Strongly Agree</td>
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<tr>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4.7</td>
<td>Strongly Agree</td>
</tr>
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<td>4</td>
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<td>5</td>
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<td>5</td>
<td>Strongly Agree</td>
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<td>5</td>
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<td>5</td>
<td>Strongly Agree</td>
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<tr>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Table 4.10: Summary of parent satisfaction survey
Student Participant Interview

The classroom teacher used a modified version of the Lane Children’s Social Validity Interview (CSVI; Lane, 1999; Appendix H) to interview the three participants at the end of the study. The semi-structured interviews were conducted to measure the acceptability of intervention components and whether the participants applied the newly learned pre-reading skills to read. Seven questions required them to answer on a 3-point scale that included “A Lot”, “A Little”, and “Not Much”. There were another three open-ended questions required them to describe part of the training program they liked and disliked. Their responses to the questions are presented in Table 4.11.

Student 1. Tracy responded “a lot” in all question except for question 4 and 7, expressing that she liked to participate in this study, learn about skills taught as well as earn rewards, applied the learned skills at home, and think she would become better a reader because of learning these letter sounds and skills. She responded “a little” in two questions, indicating the extent she used the skills learned in school and the extent she liked the study to last for one more week. Things she liked best about the training program were the rewards and the picture cards, but she did mind that the study reduced her time to play in the classroom. She did not have any comments in the last question.
Student 2. Steph responded very positively to all 3-point scale questions in Student Participant Interview except for question 7. He responded “a lot” in all seven questions, indicating that he had fun participating in this training, he liked to learn about letter sounds and skills as well as earn rewards, he applied the learned skills both in school and at home, and he believed the training would help him become good readers. He was only “a little” willing to participate in the training program for one more week. In open-ended questions, he was the only person to mention “learning letter sounds” as one of the favorite parts of the study (the other was the rewards) although some skills taught seemed a little difficult for him. He did not mention any other things in the last question.

Student 3. Henry responded “a lot” in questions 2, 3, 5, and 6. He indicated “a lot” in response to whether he liked to learn about the letter sounds and the skills, earn the rewards, use the skills learned at home, and think he would become a better reader. However, he reported “a little” in question 1, 4, and 7, indicating he had a little fun participating in this study, sometimes used the skills learned in school, and just a little wished the study lasted for one more week. He liked the rewards best and disliked the training separating him from the classroom during free play time. No other things were mentioned in the last question.
A Lot A Little Not Much

1. Did you have fun participating in this training program? Tracy, Steph, Henry

2. Did you like to learn about letter sounds and skills? Tracy, Steph, Henry

3. Did you like to earn rewards? Tracy, Steph, Henry

4. Did you use the skills that you learned in school? Steph Tracy, Henry

5. Did you use the skills that you learned at home? Tracy, Steph, Henry

6. Did you think learning the letter sounds and the skills will help you become a better reader? Tracy, Steph, Henry

7. Do you wish to participate this training for one more week? Tracy, Steph, Henry

8. What are the things you like best about this training program? Tracy: the rewards and the picture cards; Steph: learning letter sounds and the rewards; Henry: the rewards.

9. What are the things you do not like in this training program? Why? Tracy, Henry: I have less time to play in the classroom; Steph: I feel some skills are a little difficult.

10. Is there any else you would like to tell me about this training program? None

Table 4.11: Results of student participant interview
CHAPTER 5

DISCUSSION

This chapter provides a discussion of the results based on the 7 research questions posed in Chapter 1. Limitations, implications for practice, directions for future research, and a summary of the study are also discussed.

The purpose of the study was to determine whether intensive, one-on-one instruction in phonological awareness for preschool children who have been identified as at-risk for reading disabilities would positively influence the attainment of pre-reading skills, including phoneme-blending, phoneme-segmentation, and nonsense and real word-reading skills. The participants received phonological awareness instruction 15 minutes a day, five days a week. Effectiveness of the phonological awareness instruction, developed based on *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994), was determined by comparing student’s scores on Phoneme Segmentation Fluency (PSF) and Nonsense Word Fluency (NWF) measures of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) before and during intervention (i.e., during baseline and intervention conditions). Also, the effectiveness of the intervention was demonstrated by
pretest and posttest of curriculum-based measures (CBM) implemented each day based on the content of daily lesson plan. Still other pretest and posttest measures had implications to the study, including Letter Identification and Word Attack subtests in the Woodcock Reading Mastery Test-Revised, Rhyming test in Get it Got it Go, and Phoneme-Blending and Phoneme-Segmentation Test designed by Laughon (1989).

Research Question One

What are the effects of phonological awareness instruction (i.e., Phonological Awareness Training for Reading, 1994) on the phoneme-segmentation skills of preschool children at-risk for reading disabilities?

The student performances on phoneme-segmentation skills were summarized in Table 4.6. The measures on phoneme segmentation consisted of DIBELS PSF, phoneme-segmentation test designed by Laughon (1989), CBM-first, last, and middle sound segmentation. All these assessment tools showed improvement of participants’ skills in phoneme-segmentation.

A review of the data for each participant showed increases in performance during the intervention conditions as compared with the baseline conditions, as measured by DIBELS PSF (See Figure 4.2). Using a multiple probes across subjects design, every time when the phonological awareness instruction was introduced, the ascending trend
was shown on each participant. These results are similar to those found by Slocum and his colleagues (1993) and O’Connor and his colleagues (1993).

A functional relationship was demonstrated between the phonological awareness instruction and phoneme-segmentation skills. The data across the 3 participants showed evidence of prediction, verification, and replication of the effectiveness of the intervention on phoneme segmentation skills. Specifically, the participant’s change in responding once the intervention was introduced was a verification of the prediction that there would be no change in responding without the implementation of the intervention. Moreover, the same pattern was replicated in the results data across all participants. It lends support to the hypothesis that phonological awareness could be taught to children as early as preschool by explicit one-on-one instruction.

In addition to the visual inspection of data, the comparison of mean score between baseline data as intervention data also showed evidence of the participants’ gains in phoneme segmentation (Table 4.6). Based on the descriptive levels of performance in DIBELS scoring guide, after intervention performances of Steph and Henry were improved from “at risk” to only “some risk”. Even Tracy, who had the least progress, remained “at risk” level, the mean number of phonemes produced changed from 1 to 4.13. The data demonstrated that preschool children were able to make gains in phoneme
segmentation through explicit and systematic instruction in phonological awareness. It must be noted that DIBELS PSF was designed to use on Middle of Kindergarten. However, in this study the participants were preschool children, which may explain the limited progress of the participants, especially Tracy. If phonological awareness instruction in this study was implemented on kindergarteners or first graders as the primarily assumed, the effectiveness may be more prominent.

Moreover, results of phoneme-segmentation test designed by Laughon (1989) also lent support to the effectiveness of phonological awareness instruction (Table 4.6). The mean number of responding in posttest measures was 8.67 phonemes compared to 1 phoneme in pretest measures. Henry demonstrated the greatest improvement as a result of the intervention and made progress from zero to 17 phonemes.

There were three groupings in the CBM regarding phoneme-segmentation skills, including first sound segmentation (i.e., Lesson 6, 8, 13, 18), last sound segmentation (i.e., Lesson 9, 14, 19), and middle sound segmentation (Lesson 10, 15, 20). Results of the CBM were summarized in Table 4.6 and described below.

*First sound segmentation.* First sound segmentation seemed easier for the participants than other segmentation tasks. The mean of correct percent on the pretest measures was 61.92%. After intervention, the mean of correct percent was up to 81%.
Last sound segmentation. Last sound segmentation was difficult for the participants. Both Tracy and Steph got only 10.33% correct before receiving the instruction. The mean of correct percent on the pretest measures was 29.33%, and on the posttest was 71.56%. It was noted that Steph had a descending trend in the lessons focusing on last sound segmentation. The correct percent on the pretest measures in lesson 9, 14, 19 was 17%, 14% and 0, and on the posttest measures the correct percent was 88%, 67%, 22%.

Middle sound segmentation. The participants also feel difficult with middle sound segmentation. They got 29.67% correct on the pretest measures, and had a mean of 72.67% correct on the posttest measures. Something worth noticing was that Steph had a descending or unsteady trend in the lessons with emphasis of middle sound segmentation. The correct percent on the pretest measures in lesson 9, 14, 19 was 11%, 43% and 0, and on the posttest measures the correct percent was 78%, 66%, 25%.

In CBM, every time when phoneme segmentation was introduced, the gap between pretest and posttest measures was larger than other lesson groupings. Sometime after the instruction the participants still failed to reach mastery level, especially in last sound and middle sound segmentation. The findings were in accordance with the contention in the previous studies that phoneme segmentation was a more difficult skill
for children (Torgesen, et al., 1992, Torgesen & Davis, 1996). The participants made more gains on first sound segmentation compared to last sound segmentation, which was in accordance with the speculation that children made more errors with consonants at the end of words than consonants in other positions (Treiman, 1985).

Steph’s failure to exhibit ascending trend in last sound and middle sound segmentation may be accounted by three reasons: First, his tendency to be distracted from the instruction and the assessment, especially after becoming comfortable/familiar with the interventionist and the experimental setting. That is, he would make consistent errors on the initial attempt during instruction and state the correct response after corrective feedback. During assessment, he seemed to guess at the answers. Second, 15-minute length of daily treatment might not be the optimal time for all children. In addition, the school interruptions such as the frequent fire drills may also affect his performance.

Results of Rhyming test in Get it Got it Go were notable and may impact phoneme-segmentation skills. All participants made great progress in rhyming and the gap between them and the typically developing children (represented by the aim line) was reduced. Henry even correctly responded the same number of items in the final measure, which means after the intervention his performance in rhyming caught up with other peers. Some researchers identified the sensitivity to rhyme as a basic level of
phonological awareness skill in the developing sequence of phonological awareness (Adams, 1990; Torgesen, Wagner, and Rashotte, 1994). The improvement of participants’ rhyming skills might have implications to their performance in phoneme segmentations. That they successfully identified the larger units of a word served as a good start for segmentation of smaller units (phonemes). If the intervention continued to be implemented, their greater improvement in phoneme segmentation is promising.

Overall, it is clear that explicit instruction in phonological awareness skills had a positive impact on the participants’ skill. This type of intensive instruction is beneficial to preschool children at-risk for reading problems.

Research Question Two

What are the effects of phonological awareness instruction (i.e., Phonological Awareness Training for Reading) on the nonsense word reading skills of preschool children at-risk for reading disabilities?

A review of the data did not show a functional relationship between phonological awareness instruction and the improvement of nonsense word reading across the three participants. Both Tracy and Henry showed strong increases when the intervention was implemented. However, Steph’s data show little or no increase in
accuracy with the implementation of the intervention. The data indicated differing effects for the participants.

Tracy exhibited some levels of nonsense words reading during the baseline condition, but the trend was unsteady. However, a significant increase was observed after the third probe in intervention. After Tracy’s receiving the instruction, Steph and Henry’s data in baseline remained unchanged. That is, the participants who had not received the instruction exhibited unchanged responding in baseline, which provided the evidence of internal validity that Tracy’s improvement in phoneme correctly produced was because of the instruction. However, when the intervention was introduced to Steph, he did not exhibit sufficient change to demonstrate the effectiveness of the instruction. A change of Henry’s data was observed immediately when the intervention was introduced. The gradual ascending trend was shown throughout the intervention condition.

In addition to the visual inspection of data, the comparison of mean score between baseline data and intervention data also showed Tracy and Henry’s gains in nonsense word reading (Table 4.7). Based on the descriptive levels of performance in DIBELS scoring guide, after intervention Tracy’s performance was improved from “some risk” to “low risk”, and Henry’s performance was improved from “at risk” to “low risk”. As for Steph, he remained “at risk” across baseline and intervention. His mean number of
phonemes only changed from 0.5 to 1.5. The data demonstrated that not all preschool children were able to make gains in nonsense word reading through explicit and systematic instruction in phonological awareness. However, DIBELS NWF was designed to use on Middle of Kindergarten instead of preschool. Although the functional relationship could not be demonstrated because of Steph’s limited progress, it was encouraging that Tracy and Henry made gains through the instruction and the results gave some implications for training in nonsense word reading on preschool children.

Nonsense words were not directly instructed in the training. Only letter-sound correspondence was systematically instructed in the current study. Therefore, DIBELS NWF test was not an exact match with instruction. Nevertheless, we found Tracy and Henry were able to demonstrate improvement in phonological awareness skills when the nonsense words were presented. Only Steph showed no improvement in nonsense word reading. The improvement of Tracy and Henry in nonsense word reading corresponded to the finding that training in letter-sound correspondence had the great impact on early reading (Bradley & Bryant, 1983; Lundberg et al., 1988). Perhaps, if Steph has received specific instruction in reading nonsense words, he might have performed better on the DIBELS assessment.
Some researchers admitted that some minimal level of phonological awareness must be achieved to perform well in applying letter-sound relationship to reading. For example, Bradley and Bryant (1985) addressed that children with better phoneme segmentation skills learned to decode and read with more ease. However, although Steph scored the highest in DIBELS PSF measures among all participants and made gains after intervention (see Figure 4.2), he did not show improvement in NWF. This may be because although phonological awareness was a stronger predictor to reading, it is not necessarily sufficient for learning to read (Tunmer & Nesdale, 1985; Adams, 1990). Still other variables may have contributions to reading development such as the ability to identify letter names (Ehri, 1984, 1987; Foorman, Francis, Novy, & Liberman, 1991; Wolf & Bowers, 1999). Being able to identify the letter names was helpful in acquiring explicit levels of phonological awareness, and in turn beneficial to nonsense word reading. Ehri (1983) insisted that if prereaders did not know letter names, it was nearly impossible to teach them letter sounds. Muter, Hulme, Snowling, and Taylor (1997) found that the combination of phoneme segmentation skills and letter name knowledge was the best predictor for reading and spelling development. Hence, Steph’s poor performance in DIBELS PSF may be explained by his low score in letter identification at the beginning of the study, but to what extent is unknown without further investigation.
Moreover, results of Word Attack subtest in the *Woodcock Reading Mastery Test-revised* lend support to the effectiveness of phonological awareness instruction (Table 4.7). Both Tracy and Steph made gains after intervention, but the gains were slight. Their responding on the pretest measures was zero, and their responding on the posttest measures was 1 phoneme. These results should be considered carefully because the increase of 1 correct item from pretest to posttests represented 1-year improvement based on the test. This instrument might not be sensitive enough to reflect incremental changes possibly overrating the participants’ abilities. In addition, Henry’s performance in pretests and posttests was zero.

Letter-sound relationship was the basis to nonsense word reading, which was part of the instruction but the CBM consisted of real words. In Lesson 6, 11, 16, 21 and review sessions (Lesson 22, 23, 24, 25), letter-sound relationship was explicitly and systematically taught and the participants were required to apply learned skills to read real words. Tracy received instruction of all the four lessons, Steph was taught with lesson 22 and 23, and Henry did not receive any. After daily lesson was instructed, all participants outperformed than the pretest measure, demonstrating the effectiveness of phonological awareness instruction on word reading. The mean of correct percent was summarized in Table 4.7. The mean of correct percent on pretest measures was 50.72%,
which indicated that the participants had ability in phoneme blending to a certain extent before the instruction. On the posttest measures, the mean of correct percent was 77.19%. Steph still performed lowest both in pretests and posttests. Even after intervention, he only correctly responded 36.37%.

In sum, two of the three participants demonstrated important gains in phonological skills by improving their ability to read nonsense words. Nonsense words was not a direct taught skill and is a higher level skill than phonological awareness which may explain why there were differing effects across the participants.

Research Question Three

*What are the effects of phonological awareness instruction (i.e., Phonological Awareness Training for Reading) on the phoneme-blending skills of preschool children at-risk for reading disabilities?*

A review of the data for each participant showed improvement in phoneme-blending skills on the posttest measures as compared with the pretest measures, as measured by phoneme-blending test designed by Laughon (1989) and CBM focusing on phoneme blending (see Table 4.5).

Results of phoneme-blending test designed by Laughon (1989) lend support to the effectiveness of phonological awareness instruction on phoneme-blending skills (Table
The mean number of responding on the posttest measures was 7 phonemes compared to 1.33 phonemes on the pretest measures. Of particular, Henry made gains from zero to 7 phonemes correctly produced after intervention.

CBM in lesson 4, 5, 7, 12, and 17 measured the ability in phoneme blending. After daily lesson was instructed, all participants outperformed on the posttest measures than the pretest measure, demonstrating the effectiveness for phonological awareness instruction and phoneme-blending skills. The mean of correct percent was summarized in Table 4.5. The mean of correct percent on pretest measures was 87.6%, which indicated that the participants had ability in phoneme blending to a certain extent before the instruction. On the posttest measures, the mean of correct percent on the posttest measures was 98.4% (range=97%-100%). Steph performed highest both in pretests and posttests with the attainment of 100% correct after intervention. The results was consistent with the findings of Perfetti (1987) and Yopp (1988). They identified phoneme blending as “Simple Phonological Awareness” because it is an easier skill for children and the basis for other phonological awareness skills.

The findings in this study were also compatible with the results of Torgesen, Morgan, & Davis (1992) that phonological awareness instruction was effective in increasing children’s performance in phoneme blending. They also suggested an
instructional sequence to teach phoneme blending prior to phoneme segmentation, just like what has done in this study. The data obtained supported the suggestions to include phoneme blending in phonological awareness training (Grossen & Carnine, 1993; Foorman, Francis, & Shaywitz, 1997) and demonstrated preschool children could improve their phoneme-blending skills with intensive instruction.

The participants’ performances seemed more dramatic in CBM than in the test designed by Laughon (1989). Two reasons may account for the difference: First, posttests of CBM were administered immediately after instruction, and the items measured were more closely aligned with instruction, therefore a more direct match to what the participants practiced during intervention. In addition, picture cards used in CBM provided visual cues to young children and shortened their time to respond. In addition, each wordset was made of frequently seen words and reviewed for the participants before daily instruction, which increased their familiarity with the words. In contrast, words in Phoneme-Blending Test were not necessarily commonly used by young children (e.g., saw, moon, which) and presented orally without any visual cues. Although the participants were still able to blend phonemes to read these words, the speed of thinking and responding was much slower. This study shows that at-risk preschoolers can improve their phonemic blending skills with effective instruction.
Research Question Four

*Will the participants be able to correctly read words learned during intervention after the instruction has ended?*

In the maintenance probes administered every 8 lessons throughout the study. The testing items in the probes were randomly arranged from the correctly responded words in CBM to examine if the participants were still able to correctly answer when the explicit instruction was not provided. Results showed that only Tracy and Henry could correctly read words learned during intervention after the instruction has ended. The correct percent for Tracy and Henry was high. Tracy correctly responded 100%, 100%, and 93% of the maintenance probes, and Henry correctly responded 83%, 83% and 94%. However, Steph’s correct percent was 100%, 79%, and 36%, which was consistent with the fact that he became increasingly distracted during intervention and assessment. The possible reason of the consistent errors he made was that during intervention he only repeated the corrective feedback unconsciously and guessed at the answers when being assessed. In addition, the completion of the study was the end of the school year. Descending trend of his performance in maintenance probes might also be influenced by the coming summer break and his problems in concentrating deteriorated. One suggestion of Steph is to give him intensive instruction for a few weeks in four weeks blocks. That is
four weeks of instruction and two weeks of no individual instruction to help him focus.
Another way is to change of the experimental setting from the cluttered storage room to a neater room to decrease his distraction.

There were not any similar studies found in the literature utilizing maintenance and generalization probes.

Research Question Five

*Will the participants be able to correctly read untrained words composed of learned letter sounds at the completion of the study?*

In the generalization probe administered at the conclusion of the study, the nonsense words composed of learned letter sounds were developed by the researcher. In the probe, Tracy and Henry correctly produced most of sounds represented by letters of the words tested, but only Henry further blended the individual phonemes in order to read words. Tracy correctly produced all individual letter sounds of the words except for /c/ sound. The number of letter sounds she correctly produced was 23. However, she failed to blend the letter sounds together and read the whole word. Henry performed the highest among all participants. In addition to sound out the individual letters of the words, he successfully read two untrained words. Henry correctly produced all individual letter
sounds of the words except for /e/ and /i/ sound. The number of letter sounds he correctly produced was 32.

Steph’s production of letter sounds was limited. He could only correctly identified letter sounds /h/, /t/, and /o/, and the number of letter sounds correctly produced was 4. Although Steph had good skills in phoneme blending, Steph’s failures in identifying most of letter sounds blocked him from blending phonemes to read the whole word. Steph may have benefited from explicit instruction on letter naming along with letter-sound instruction. Overall, two of the participants were able to demonstrate generalization of phonological awareness skills.

Research Question Six

*What are the opinions of the classroom teacher about the effectiveness of phonological awareness instruction (i.e., Phonological Awareness Training for Reading)?*

The classroom teacher completed social validity questionnaires at the completion of the study. In general, the teacher responded positively regarding the usefulness and the outcome of the target skills included in this study.

The classroom teacher, Ms. A, was the person who interacted with students every day and was sensitive to their performance in school, especially in the circle time twice each day from 9:00 am to 9:15 am and 10:15 am to 10:30 am in which all students
engaged in pre-reading activities. Ms. A mentioned that initially some participants had difficulty in pre-reading skills, but now all participants showed a noticeable growth. For example, the participants had faster and more accurate responses to activity involving letters, not only when being asked to point out specific letters within words, but also when sounding out the initial sound of a word. In addition, the children were able to recognize letters of their names, and their attention extended to letters that were not in their names.

In the 5-point Likert Scale, Ms. A “strongly agreed” that the phonological awareness instruction used in this study supplemented her current classroom instruction, taught important skills, and had lasting positive effects. Also, she “strongly agreed” that she would permit to continue the intervention if taught by someone else and would recommend it to others. In contrast, in the response to whether she would use the intervention in the future when needed, Ms. A expressed “agreed” instead of “strongly agreed”.

The reasons that the classroom teacher would not “strongly agree” to use the intervention by herself could be attributed to the level of teacher involvement in this study. Because the phonological awareness instruction in this study was designed to be administered one-on-one and “pull out” from the daily free play time in the classroom,
the interventionist, rather than the classroom teacher, was the person in close proximity to
the intervention in the experimental setting. During free play time, the classroom teacher
was also occupied by the classroom routine such as helping the other students with the
completion of worksheets and excused from observing the how the intervention
implemented. Although the classroom teacher was shared with the participants’ progress,
she never got the opportunity to observe the phonological awareness instruction
first-hand.

In addition, the opportunities for the classroom teacher to observe the
participants’ progress were limited. Only two circle time, each lasted 15 minutes, was
implemented in the preschool classroom every day, and only when the activities were
focusing on letter sounds could the classroom teacher notice whether the improvement
occurred to the participants. Since Ms. A played a critical roles to maintain the
cooperation of the participants to be involved in the study, hopefully if sufficient training
of the procedures of the instruction will be provided or if the classroom teacher will be
involved in the study in a certain extent, the possibility for her to implement the
phonological awareness instruction will also be increased.
Research Question Seven

*What are the opinions of participants and their parents about the effectiveness of phonological awareness instruction (i.e., Phonological Awareness Training for Reading)?*

The social validity questionnaires were sent to the parents with a cover letter with the description of the study and appreciation for their children’s cooperation. All three parents responded to the social validity questionnaires and expressed their support and impression about the results of the study. Although the parents did not have opportunities to engage in the study or attend the meetings, they perceived the children’s progress through anecdotes in daily life. Tracy’s parent responded that the Tracy’s interest towards letters and words increased. She tried to identify and sound out letter sounds when seeing a new word. Steph’s parent found he not only started to sound the letters out using what he had learned but also express the interests towards the word meanings. Henry’s parents completed the Henry started to read unfamiliar words, which he never did before. Moreover, his speech has improved greatly since he participated in the study.

The parents’ responses regarding the outcomes of the phonological awareness instruction were very positive. All parents responded that they “strongly agreed” the
intervention was effective in preparing their children for future reading, and found their children tried to identify letter sounds when a new word was presented. Also, all parents expressed their “strong agreement” regarding their children’s participation in the intervention this semester, and hoped the children were able to receive the phonological awareness training continuously. The reasons that Tracy’s parent expressed “agreed” about the effectiveness of the instruction on letter sounds, and Henry’s parents marked “agreed” that the child became more sensitive and interested in letters and words may be because these two participants had already exhibited some levels of responding in nonsense word reading. Unlike phoneme-segmentation skill which was seldom perceived by a layman, ability in word reading could be easily identified because it was dealing with the application of letter-sound relationship. In this perspective, Tracy and Henry might already try to sound words out prior to the study, so their parents thought the effects of the instruction was not so prominent.

The participants were interviewed at the completion of the study. All of the three participants expressed positive attitudes towards the reading groups. All of them acknowledged that they liked to learn about letter sounds and skills and earn rewards very much. They also had fun participating in this training program except for Henry. Henry was the only one expressing only “a little” liked the participation. One possible reading
for his less interest towards the instruction may be because it was implemented in a separate room in one-on-one basis and his free play time was reduced, which was also his dislike in question 9. Also, all participants indicated that they frequently used the skills learned at home, but Tracy and Henry only marked “a little” for the use of the skills in school. The possible reason may be due to the limited opportunities of group activities in preschool and the tight schedule every day. Only two circle time, each lasted for 15 minutes in the preschool daily schedule, may contain some activities with the pre-literacy skills. On the contrary, the preschool children stayed at home for a long time each day because the preschool ended at 11:45 am. They had many opportunities to interact with their family and engaged in free speaking consisting of what they observed around or what happened today and thus the frequency to use of words and letter increased. All participants uniformly reported that they did not wish the training lasted for one more week, which was possibly due to the completion of the study was the end of the school year. They might think this question meant they could not have the summer vacation immediately, and marked “a little” to express their concern. In the question regarding their preferred things in the study, the rewards for cooperation were attractive to all participants. Tracy also liked the picture cards with cartoons, which was especially shown when she saw a new wordset. She was always excited to name the picture before the
instruction. Although Steph was distracted easily during intervention, he enjoyed to learn letter sounds.

Limitation of the Study

Lack of Language Assessment

One limitation of the study is the lack of language assessments conducted prior to and at the end of the study. In recent years, some researchers suggested that the acquisition of phonological awareness was influenced by oral language skills (Dickinson, McCabe, Anastasopoulo, Peisner-Feinverg, & Poe, 2003; Olofsson & Niedersoe, 1999). Sevcik (2005) pointed out that both receptive vocabulary and expressive vocabulary knowledge contributed to phonological awareness skills. Torgesen and Davis (1996) further indicated that general verbal ability was one of the predictors to phoneme-segmentation skills. Language assessment will provide more information to determine if the participants have the age-appropriate expressive and receptive language skills which are the prerequisite to participate in this study. The language pretest and posttest measures could also determine whether the phonological awareness instruction is beneficial to participants’ language skills. A standardized language assessment, such as the Peabody Picture Vocabulary Test-revised (PPVT; Dunn & Dunn, 1981) or Preschool
Language Scale-3 (PLS-3; Zimmerman, Steiner, & Pond, 1991), is recommended in future research.

Number of lessons taught

25 lesson plans, including 4 review sessions, were designed based on the instructional logic and sequence of *Phonological Awareness Training for Reading* (Torgesen & Bryant, 1994). Due to the multiple baselines across subjects design and the end of the school year, the number of lessons taught to each participant varied. The school closed in mid-May due to the need to demolish the current school building. This created an additional layer of excitement throughout the school. Tracy received total of 25 lessons including 4 review sessions, Steph received only 23 lessons including 2 review sessions, while Henry received only 21 lessons without any review session. The varied numbers rather than the predetermined number of lessons taught to participants were limitations of the study. Although the skipped lessons were only review sessions, they might still have impact on the assessments at the end of the intervention.

Length of daily treatment

The researcher did not examine the effects of the length of daily instructional time on dependent variables. Although the 15-minutes daily treatment was predetermined, the length of daily treatment did not count as a variable in this study. Sometimes the
instructional time for Tracy was up to 20 minutes, especially at the initial stage in the intervention conditions. This is because sometimes the researcher tried to slow the instructional pacing as well as increase Tracy's practice time with corrective feedback. Additional instructional time seemed not to enhance her performance in the posttests. Young children seemed to become distracted easily, needing to be redirected to focus on instruction, which created a loss of instructional time. Steph may have benefited from a shorter instructional time, possibly two 7-8 minute sessions.

*Difficulty in Accommodating to Classroom Routines*

Instructional Format of the study was on one-on-one basis as a supplemental intervention. The experimental setting, a separate storage room, was not a typical environment for a special education preschool classroom. The room was a storage room which was cluttered with supply boxes. The instructional format in this study could be argued for two reasons: First, the individualized attention that the participants received during the study may have contributed to the gains in dependent variables. Second, the personnel shortage issues were emerged. Such requirement of an additional teacher serving as the interventionist might not be available to schools, especially in poor school district. Wilson, Lipsey, and Derzon (2003) also indicated that many of the evident-based phonological awareness training programs were typically implemented by researchers or
by the school staff supervised by the researchers. Without research interest and purposes, the acceptability and feasibility of such programs were doubted. In order to increase the future implementation of the phonological awareness instruction after the study has ended, change of instructional format may be needed to accommodate to the existing classroom routines on an ongoing basis.

**Difficulty to Control Extraneous Variables**

In addition to the independent variable in this study, there were still some possible salient variables that might influence the results of the study. Even though no formal reading instruction existed in the preschool, some early literacy activities were included in the circle time such as initial sounds identification. In addition, familial factors regarding whether the family members have the history of language difficulties, how much the participant’s level of exposure to language in daily life, and how family members responded to the participant’s sound out letters might also be influential to the intervention. However, these variables are difficult to control or to estimate the influential extent. In addition, cautions are needed because phonological awareness is not the only factor to reading development. Other factors, such as intelligence, receptive vocabulary, language abilities, memory skills, and socioeconomic status, may also result in variability in reading development (Buss & VanIJzendoorn, 1999).
Classroom Implications

The findings of this study have important classroom implications for effective instruction and the prevention of learning problems in young children. This section is organized into the following topics: (a) Instructional format, (b) The use of manipulative letters, (c) Instructional sequence, (d) Embedding

Instructional Format

Due to the limited human resources and tight schedule of classroom settings, how to allocate resources within the classroom to accommodate the phonological awareness instruction in the future needs to be addressed. In order to attain the broader intervention dissemination, these research need to be conducted with understanding of school routines, local conditions and training program (Durlak, 1998; Zins, Elias, Greenberg, & Weissberg, 2000). Individualized instruction was very intensive, but sufficient human resources were needed. One solution of instruction on one-on-one basis was to use trained parent volunteers working with an instructional assistant during free play time while teaching phonological awareness. Moreover, small groups composed of 3 or 4 students are feasible to be implemented. For example, use the instructional assistant with sufficient training in special education classroom to implement the teacher-led phonological awareness instruction. Another advantage of small groups is that group
instruction is more close to the natural classroom environment with the common stimulus. Moreover, active student responding may be enhanced by choral responding or academic games used in group instruction (Heward, 1996).

*The use of manipulative letters*

Manipulative letters representing each phoneme were used in this study as the supplementary of the phonological awareness instruction. Participants in this study seemed motivated to manipulate the concrete letters on the whiteboard to compose words and identify the letter-sound relationship. For example, when the word *dig* was orally presented to Henry for last sound identification, he answered the letter sound and also picked up the letter G, putting on the whiteboard. When the first, middle, and last letters were put on the board, Tracy not only identified all individual phonemes but also automatically put the letters closer to blend and read the whole word. The use of manipulative letters was in accordance with the standpoints of some researchers. Ball and Blachman (1988) confirmed the benefits to require the subjects to represent the number of phonemes in one to three-syllabic words. Ehri (1984) also suggested that knowledge of letter symbols was able to facilitate the development of phonological awareness.
Instructional Sequence

The phonological awareness instruction of this study began at rhyming as warm-up activities, phoneme blending and phoneme segmentation, and letter-sound correspondence. These tasks were sequenced in an order that approximates the development of phonological awareness. The detection of larger units, rimes and onsets, generally develop early before students are exposed to formal reading instruction. Blending and segmentation skills, on the other hand, develop later as students begin formal reading instruction (Bryant, et al., 1990; Leafstedt, 2002, Muter et al., 1998). The study of Lundberg and his colleagues (1988) conducted a study with large groups of preschoolers in which the instructional sequence to teach phonological awareness were rhyme production, sentence segmentation, syllable splitting, and tasks regarding manipulation of phonemes levels. The word structures initially used was VC and CV, then words with more complex word structure was introduced in the fifth month. Future design of the lesson plans may start at more basic level to introduce larger unit such as syllable and rime levels with a period of practice of time instead of just three lessons. In addition, all the words used in this study were one-syllabic words in the CVC structure. Because middle sound identification was difficult for young children, future researchers are suggested to try words composed with two phonemes first. VC structure (e.g., if, at)
and CV structures (e.g., *ma, be*) were hypothesized easier for preschool children on phoneme blending and phoneme segmentation.

*Embedding Phonological Awareness Instruction into Meaningful Context*

This implication resulted from the anecdotal evidences from the social validity measures. According to the classroom teacher and the parents of the participants, the participants have applied the learned phonological awareness skills to daily life, such as find the same sound in their names from other words seen in life. Some researches suggested that skill instruction should be involved within the context of meaningful reading or writing (Wadlintonm 2000; Yopp, 1992). For example, tell the students “line up for lunch if your name has a /t/ at the end” (Lane, et al., 2002; p.109). Explicit phonological awareness instruction combined with the instruction in how to apply the learned skills in a meaning context may provide students extensive practice (Cunninghan, 1990; Lane et al., 2002) and needs be included in curriculum design.

*Direction for Future Research*

Implementation of evidence-based instruction to determine what works best for children’s reading development is of particular interest to educators, administrators, and policy makers. The effects of the commercially phonological awareness instruction were examined to see if its effectiveness for early literacy skills could be empirically validated.
These skills included phoneme blending, phoneme segmentation, and nonsense word reading. Preschool children who have not received any formal reading instruction but were at-risk for later reading failure were of particular interest in this study. Some directions for future research as an offshoot from this study are identified and discussed.

One direction for future research is to extend the duration of data collection and conduct a longitudinal study to gain further information about intervention efficacy. Because the final purpose of teaching the at-risk preschool children is to prevent their later reading failure, it is variable if the follow-up data will be collected through the first and second grade. Existing studies reported that phonological awareness skills, including PSF and NWF scores in kindergarten, are highly correlated with reading achievement in first grade (Juel, 1988). With the longitudinal study, whether phonological awareness skills gained during the study will impact on authentic reading of connected text such as vocabulary and comprehension could be investigated to see if the target students will be able to catch up their peers and no more be identified as “at-risk for poor reading achievement”.

Dealing with the instructional format to accommodate the classroom settings, peer tutoring may also work. Although peer tutoring is seldom used in younger kids or phonological awareness instruction, it may provide high motivation for them. Fuchs,
Fuchs, Thompson, Al Otaiba, and Yen (2001) combined phonological awareness training with decoding instruction and implemented in the form of peer-mediated instruction. These researchers suggested that the use of peer tutoring on young children has the potential for accelerating student achievement due to it has the advantages which may not be available in teacher-mediated instruction. Although principles of effective instruction, such as frequent opportunities to respond, immediate error correction and feedback, reinforcement and praise, can also be achieved by teachers, peer-mediated instruction does provide the social interaction and peer attention which may motivate students to learn. The special education pre-school in this study was an inclusive classroom, and there are some typically developing children included in it. The future direction for research is trying to pair children at-risk for reading disabilities for their typically developing peers to conduct the phonological awareness instruction to measure the students’ growth in phonological awareness skills. Also, caution is needed because during the initial stage to learn phoneme, the teacher needs to monitor the correct pronunciation of phonemes of the student tutors. Furthermore, comparison of peer-mediated instruction and teacher-mediated instruction will be valuable.

Something noticeable is that although at the beginning of the study all participants were selected based on similar phonological level, there were individual
differences towards their improvement on the progress monitoring measures, especially in NWF. Henry particularly had dramatic improvement in NWF immediately after the intervention was introduced, and visual presentation of Tracy’s performance was in a gradual increasing trend. However, even after several weeks of intervention Steph’s improvement in NWF was limited and unstable. The same results was shown in the studies of Lundberg et al. (1988) and Torgesen and his colleagues (1992), the children who performed lower on pretest measures did not necessarily had reliable growth in phonological awareness skills after phonological awareness instruction. The variability in response to the intervention also lends further evidence of the necessity of ongoing performance monitoring of individual students in an effort to determine what revisions could be made to increase the efficacy of the intervention. It also suggested the need for some intermediate skill development (e.g., letter naming).

Summary

This study showed that the preschool children aged between 5 and 6 years old who were identified as at-risk for reading disabilities could be taught pre-reading skills by explicit phonological awareness instruction. The pre-literacy skills improved by phonological awareness instruction included phoneme-blending, phoneme-segmentation, and word reading. Also, their performances in rhyming were better during intervention
and the gap with typically developing children was reduced. It also showed that these skills learned could be maintained over time, and the participants tried to generalize the learned letter-sound correspondence to read untrained words.

The participants of this study were 3 preschool children who were recommended by their classroom teacher first and identified as at-risk according to the word attack and letter identification subtests of the Woodcock Reading Mastery Test, rhyming subtests in Get it Got it Go, and phoneme-blending and phoneme-segmentation tests designed by Laughon (1989). The phonological awareness instruction used in this study contained 25 lesson plans developed by the researcher based on the Phonological Awareness Training for Reading (Torgesen & Bryant, 1994). The participants were trained to blend and segment phonemes and try to read words.

This study supported other research findings in the literature about teaching children at-risk for reading disabilities and future academic failure (Vellutino & Scanlon, 1987; Wagner, et al., 1997). These children could benefit from a supplemental curriculum using appropriate sequence to train their phonological awareness, which is said to be a reliable predictor of future reading development. The effects of phonological awareness instruction have been addressed in previous research; however, this study contributed to the literature in several significant ways. First, it extended the participants to children as
young as preschool and had implications that phonological awareness was teachable to younger children. Second, the results of this study indicated that children being considered at-risk for reading abilities and had not received any formal reading instruction are capable of improving their pre-literacy skills in preparation for their future reading. Third, it provided maintenance and generality measures. Participants were not only successful in phoneme-blending and phoneme-segmentation, but also maintained the effects to read words after the instruction has ended and tried to read the letter sounds of untrained words. Fourth, the DIBELS as an appropriate instrument to monitor student progress was recognized because the easy, time-efficient procedures and the measurement matched with the pre-reading skills intended to measure the ability to future word reading. Finally, it is significant for educators to work to prevent reading failure in young children. This study demonstrated that phonological awareness skills can be effectively instructed to preschool children better positioning them for reading success.
LIST OF REFERENCES


Allington, R. L. (1994). The schools we have, the schools we need. *The Reading Teacher*, 48, 14-29.


E. O’Shaughnessy (Eds.), *Interventions for children with or at risk for emotional and behavioral disorders* (pp. 3-17). Boston, MA: Allyn and Bacon.


Torgesen, J. K., & Bryabt, B. (1994). *Phonological awareness training for reading kit*. Austin, TX: Pro-Ed.


APPENDIX A

PARENT LETTER FOR PARTICIPATION
February 1, 2007

Dear Parent or Guardian,

My name is Yi-Wei Hsin and I am currently a graduate student in Special Education at The Ohio State University. An important requirement for completing my course of study is to conduct research as part of a doctoral dissertation. I am in the process of preparing research that I will be carrying out in your child’s classroom. I will be conducting the research under the supervision of Dr. Ralph Gardner, a professor in the College of Education and Human Ecology. I am writing to explain my research and ask your permission for your child to participate. The following is a description of the study I am planning to conduct.

This study will examine how well students can improve their phoneme blending, phoneme segmentation, and word reading skills through phonological awareness instruction. In other words, I will teach your child how to read. The study will follow the procedures of *Phonological Awareness Training for Reading* designed by Torgesen and Bryant (1994). This curriculum has shown to be effective in many other studies and will be examined in my study as well. In such a phonological awareness system, your child will work with a trained English native speaker on one-on-one basis to build letter/sound relationship and practice reading words. Your child will participate in 15-minute individualized instruction, 5 times a week. The instruction will take place in a room adjacent to the classroom during free play time.
Sessions will not be video- or audio- taped. Your child’s name will not be revealed in any kind of publication, document, or any other form of report or presentation developed from this study. I am excited about this project, and I hope you will grant permission for your child to participate in this study. I will ask your child’s teacher for the following information: your child’s age, gender, grade level, and whether or not your child attends school regularly (i.e., is rarely absent from school). We will not need to see your child’s school records in order to conduct this study.

Attached are two copies of the consent form for Participation in Educational Research. By signing this consent form you agree to allow your child to participate in this study as described in this letter. Please sign and return one signed copy of the consent form using the attached stamped envelope to me, and keep the second copy for your records. If you have any questions about details of this study, feel free to call me at (614) 805-2042 or you may also contact Dr. Gardner at (614) 292-3308, or by e-mailing me at hsin.2@osu.edu.

Sincerely,

Yi-Wei Hsin            Ralph Gardner
Ph.D. Student            Associate Professor
Advisor

Enclosures: 2 copies of Consent Form for Participation in Educational Research
APPENDIX B

PARENT CONSENT FOR PARTICIPATION IN EDUCATIONAL RESEARCH
February 1, 2007

I consent to participate in a research study evaluating the effects of phonological awareness instruction. Ms. Yi-Wei Hsin will conduct this study under the direction of Dr. Ralph Gardner. Ms. Yi-Wei Hsin has explained to me the purpose and procedures for the study. She has also explained to me the procedures of phonological awareness instruction that the students will be taught. I understand that my identity will not be revealed to anyone other than people directly involved in the study, or by means of publication, documentation or any other form of report and presentation developed from this research. Additionally I understand that I have the right to withdraw my consent to participate at any time during the study.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction.

I acknowledge that I have read and fully understand this participant consent form. I sign it freely and voluntarily. An additional copy has been given to me.

__________________________________________  __________
Signature of Participant                    Date

I understand that as a part of this study Ms. Yi-Wei Hsin will be conducting a social validity assessment and I will be asked to answer questions pertaining to my opinion on the intervention. I grant permission to Ms. Hsin to use this information as part of the study.

__________________________________________  __________
Signature of Participant                    Date
APPENDIX C

ORAL SOLICITATION TO STUDENTS
My name is Yi-Wei Hsin and this is Ms. Baker. We go to school at The Ohio State University. We will be conducting a study in your school during the next few months. In other words, we will be working with you.

What we will be doing is trying to see how well you hear the different sounds in words and whether we can help you improve your ability to hear the different sounds of English. In addition to learning about the sounds in your language we will also want to see how many words you can read in a minute. You will participate in 15-minute a day, 5 days a week in a small room. If you or your parents decide at any time you do not want to participate in you can drop out of the study without any negative consequences.

Do you have any questions?
APPENDIX D

CONTENT FOR EACH LESSON WITH THE WORDSET
<table>
<thead>
<tr>
<th>Wordset</th>
<th>Lesson</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>Introduction to the concept of rhyme</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Choose words that rhyme</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Identify if 2 words that rhyme</td>
</tr>
<tr>
<td>II</td>
<td>4</td>
<td>Blending words divided into onset and rime</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Blending words divided into individual phonemes</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Phoneme-segmentation: First sound identification</td>
</tr>
<tr>
<td>III</td>
<td>7</td>
<td>Blending words divided into individual phonemes</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Phoneme-segmentation: First sound identification</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Phoneme-segmentation: Last sound identification</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Phoneme-segmentation: Middle sound identification</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Letter-sound relationship</td>
</tr>
<tr>
<td>IV</td>
<td>12</td>
<td>Blending words divided into individual phonemes</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Phoneme-segmentation: First sound identification</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Phoneme-segmentation: Last sound identification</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Phoneme-segmentation: Middle sound identification</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Letter-sound relationship</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Blending words divided into individual phonemes</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Phoneme-segmentation: First sound identification</td>
</tr>
<tr>
<td>---</td>
<td>----</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Phoneme-segmentation: Last sound identification</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Phoneme-segmentation: Middle sound identification</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Letter-sound relationship</td>
</tr>
<tr>
<td>V</td>
<td>22</td>
<td>Review session</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Review session</td>
</tr>
<tr>
<td>VI</td>
<td>24</td>
<td>Review session</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Review session</td>
</tr>
</tbody>
</table>
APPENDIX E

LESSON TOPICS BASED ON THE CONTENT
<table>
<thead>
<tr>
<th></th>
<th>Content</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Warm-up Activities: Rhyming</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>2</td>
<td>Blending words divided into individual phonemes</td>
<td>4, 5, 7, 12, 17</td>
</tr>
<tr>
<td>3</td>
<td>Phoneme-segmentation: First sound identification</td>
<td>6, 8, 13, 18</td>
</tr>
<tr>
<td>4</td>
<td>Phoneme-segmentation: Last sound identification</td>
<td>9, 14, 19</td>
</tr>
<tr>
<td>5</td>
<td>Phoneme-segmentation: Middle sound identification</td>
<td>10, 15, 20</td>
</tr>
<tr>
<td>6</td>
<td>Letter-sound Relationship</td>
<td>11, 16, 21</td>
</tr>
<tr>
<td>7</td>
<td>Review Session: Letter-sound Relationship</td>
<td>22, 23, 24, 25</td>
</tr>
</tbody>
</table>
APPENDIX F

SOCIAL VALIDITY QUESTIONNAIRE-TEACHER FORM
SOCIAL VALIDITY QUESTIONNAIRE-TEACHER FORM

Teacher: ____________________       Date: ____________________

Please indicate the extent to which you agree or disagree with each statement below by circling the appropriate number. Please write your responses for items 8 and 9.

<table>
<thead>
<tr>
<th>The phonological awareness instruction:</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supplemented my current classroom instruction</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2. Taught important skills</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3. Will have lasting positive effects</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4. Is one I will use in the future when needed</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5. Is one I will permit to continue if taught by someone else</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6. Is one I will recommend to others</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. In your opinion, rate the effectiveness of the intervention for:</th>
<th>Very Effective</th>
<th>Moderately Effective</th>
<th>Neutral</th>
<th>Somewhat Effective</th>
<th>Not at all Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Student 2</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Student 3</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

8. What are some changes you see in your child’s reading ability now as compared to the beginning of the school year? (For example, their responding in circle time)

9. Additional anecdotes or comments you would like to share:
APPENDIX G

SOCIAL VALIDITY QUESTIONNAIRE-PARENT FORM

(WITH COVER LETTER)
May 16, 2007

Dear Parent/Guardian,

As you are aware, your child has participated in phonological awareness instruction that focused on some essential reading skills since March of 2007. Your child was involved in 15 minutes of supplemental phonological awareness instruction five days a week. A graduate student majoring early childhood education, Ms. Baker, implemented the instruction.

We would like to know your opinion on how the **Phonological Awareness Training for Reading Program**, in which your child participated, helped him/her. Please take a few minutes to complete the attached questionnaire. Any additional comments are always welcome.

Please return this questionnaire to Ms. Darica so that we could use your information to assess our phonemic awareness program. If you have questions or would like to know more about your child’s progress, please feel free to contact me at (614)805-2042 or by e-mailing me at hsin.2@osu.edu.

Thank you for your time and feedback.

Sincerely,

Yiwei Hsin          Ralph Gardner
Ph.D. Student      Associate Professor
                  Advisor
SOCIAL VALIDITY QUESTIONNAIRE-PARENT FORM

Child’s name: __________________________ Date: ______________________

Parents name: __________________________

Please indicate the extent to which you agree or disagree with each statement below by circling the appropriate response. Please write your responses for items 7 and 8.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel the phonemic awareness instruction has been effective in teaching my child <strong>letter sounds</strong></td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
<tr>
<td>2. I feel the phonemic awareness instruction has been effective in preparing my child to <strong>future word reading</strong></td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
<tr>
<td>3. I find my child becomes more sensitive and interested in letters and words around him (her)</td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
<tr>
<td>4. I find my child tries to identify letter sounds when he (she) sees a new word</td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
<tr>
<td>5. I am glad my child participated in the phonemic awareness program this year</td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
<tr>
<td>6. I would like my child to continue receiving the phonemic awareness instruction next year</td>
<td>Strongly Agree Agree Neutral Disagree Strongly Disagree</td>
</tr>
</tbody>
</table>

7. What are some changes you see in your child’s reading ability now as compared to the beginning of the school year?

8. Additional anecdotes or comments you would like to share:
APPENDIX H

STUDENT PARTICIPANT INTERVIEW
## Student Participant Interview

Participant’s name:________________________
Interviewer:_______________________   Date:_______________________

<table>
<thead>
<tr>
<th></th>
<th>A Lot</th>
<th>A Little</th>
<th>Not Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did you have fun participating in this training program?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
<tr>
<td>2. Did you like to learn about letter sounds and skills?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
<tr>
<td>3. Did you like to earn rewards?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
<tr>
<td>4. Did you use the skills that you learned in school?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
<tr>
<td>5. Did you use the skills that you learned at home?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
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<tr>
<td>6. Did you think learning the letter sounds and the skills will help you become a better reader?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
<tr>
<td>7. Do you wish to participate this training for one more week?</td>
<td>☆☆☆</td>
<td>☆</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX I

PROCEDURAL INTEGRITY CHECKLIST
Procedural Integrity Checklist

Interventioner:______________________ Observer:___________________________
Date: ____________ Time:___________ Student:___________ Lesson:___________

Instruction:

(1) Indicate whether the implementer performs each of the following steps by checking the appropriate box.
(2) Write comments, observations, or suggestions for improvement in the space provided.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull each student individually out of the classroom</td>
<td></td>
<td></td>
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<tr>
<td>Follows script</td>
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<tr>
<td>Models the skill, provides practice before individually assessing student on skill (For example, says “The sound of the letter d is /d/. Say the sound of the letter with me: /d/. What is the sound of the letter d?)</td>
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<tr>
<td>Use manipulatives (e.g., alphabet letters, picture cards) as outline in the lesson</td>
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<tr>
<td>Provides immediate feedback/error-correction (Example: says “Good” for correct responses, and provides correct response for incorrect responses)</td>
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<tr>
<td>Uses appropriate pacing (e.g., fast for review skills, provides</td>
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<td></td>
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<tr>
<td>Thinking pause on more difficult skills</td>
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<tr>
<td>---------------------------------------</td>
<td>-------</td>
<td></td>
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<tr>
<td>Delivers error-correction according to script</td>
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<td></td>
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<tr>
<td>Provides praise only at the end for cooperation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session integrity = ( \text{Number of steps completed} \times 100 ) ( \text{Total number of steps (8)} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes/Comments: ____________________________________________