

## Research Article

# Efficacy of Online Learning Modules for Teaching Dialogic Reading Strategies and Phonemic Awareness

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**Purpose:** The purpose of this study was to create and evaluate online learning modules designed to teach speech-language pathologists (SLPs) dialogic reading strategies and phonemic awareness skills.

**Method:** School-based SLPs ( $n = 28$ ) were assigned to complete one of two online learning modules. One module taught dialogic reading strategies, and the other taught phonemic awareness. Participants in the dialogic reading group served as controls for the phonemic awareness group and vice versa. Participants completed a pretest that assessed phonemic awareness skill and knowledge of dialogic reading strategies to control for prior knowledge and skill, completed their assigned module, and then completed a posttest that assessed phonemic awareness skill and knowledge of dialogic reading strategies.

**Results:** Data were analyzed using multiple regression. The independent variables were pretest score, group, and the

pretest score by group interaction. The dependent variable in the first model was posttest score on the dialogic reading measure. The dependent variable in the second model was posttest score on the phonemic awareness measure. There was a statistically significant group by posttest score interaction in the dialogic reading model, indicating that the dialogic reading module was effective for improving knowledge of dialogic reading strategies. There was not a statistically significant group by posttest score interaction in the phonemic awareness module, indicating that the phonemic awareness module was not effective for improving phoneme segmentation skill and phoneme manipulation skill.

**Conclusions:** Online learning modules may be effective for establishing knowledge needed for evidence-based practice in speech-language pathology. Additional research is warranted to determine whether online learning modules can be used to change clinician intervention behavior.

Children with communication disorders including language impairment and hearing loss are at risk for reading difficulties (Catts et al., 2005; Geers & Hayes, 2011). Speech-language pathologists (SLPs) are among the professionals responsible for addressing those difficulties (American Speech-Language-Hearing Association [ASHA], 2010). Nevertheless, mounting evidence indicates that even when children show symptoms of early reading difficulty, a majority of school-based SLPs do not write goals for or treat literacy skills (e.g., ASHA, 2020; Schmitt et al., 2014). Professional development related to best practices for early literacy intervention is warranted; however, the

body of literature reporting professional development program efficacy for SLPs is relatively small. Furthermore, effective professional development programs must address barriers faced by practicing SLPs as they attempt to implement evidence-based practice, including a lack of time to participate in new training (Fulcher-Rood et al., 2020). The purpose of this study was to create and evaluate online learning modules designed to teach SLPs strategies and requisite skills for delivering effective early literacy instruction.

Literacy difficulties experienced by children with communication disorders may manifest in reading comprehension and/or word recognition and decoding. Reading comprehension difficulties result primarily from weaknesses in vocabulary and morphosyntax (Adlof & Catts, 2015; Ouellette, 2006), whereas word recognition and decoding difficulties result primarily from weaknesses in phonemic awareness (Wagner & Torgesen, 1987). Intervention that supports vocabulary growth, such as dialogic reading (Whitehurst et al., 1999), promotes later reading comprehension (Beck et al., 1982), and intervention that focuses

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on phonemic awareness improves decoding skills (Torgesen et al., 1999).

Because children with language impairment often have difficulty with vocabulary and phonemic awareness (McGregor et al., 2013; Werfel & Krimm, 2017), in this study, we focused on SLPs' (a) knowledge of dialogic reading strategies and (b) phonemic awareness skill requisite for phonemic awareness intervention. Both topics have the potential to improve SLP early literacy practices in different ways. Dialogic reading is an intervention strategy targeting comprehension-related early literacy skills. Phonemic awareness is a foundational skill that SLPs need in order to implement phonemic awareness intervention and to improve phonics-based reading intervention. The design of this study allowed us to explore the effect of short-term, online training on some of the knowledge and skills necessary for early literacy intervention.

## Dialogic Reading

Dialogic reading is a method of reading with preschool children that improves vocabulary and mean length of utterance for children with disabilities (Dale et al., 1996; Towson et al., 2016). Dialogic reading enriches reading interactions and promotes adult use of strategies that encourage child engagement with the text (and, by way of that engagement, comprehension; e.g., Whitehurst et al., 1999). At its core, dialogic reading is aptly named because the method asks adults to engage children in dialogue around reading.

One method of teaching adults to use dialogue during book reading is to teach the adult the dialogic reading acronym *CROWD* (Whitehurst et al., 1999); *CROWD* stands for Completion, Recall, Open-ended questions, Wh-questions, and Distancing. The acronym encourages five adult behaviors that prompt children to actively engage with the story presented rather than passively listening to the adult read.

The Completion prompt used during dialogic reading requires the adult to produce all but the last word (or phrase) of a sentence to allow a child to attempt to complete the sentence. For example, the reader might say, "The horse jumped over the \_\_\_\_" and ask the child to attempt to fill in the answer. A child is then actively engaging with story-book reading by being required to think of a response that is semantically appropriate to complete the sentence.

The Recall prompt encourages the reader to ask the child questions about the part of the book that the adult just finished reading. For example, a reader might say "Wait, what did we say just happened to the fish in the story?" Recall prompts encourage a child to reflect on what just happened in the story, and therefore to actively process events as the adult reads. It also provides an adult with an opportunity to clarify any misunderstood information.

The Open-ended prompt requires the reader to make a comment or ask a question that requires an open-ended response from the child (as compared to a one- to two-word response). A reader might say "Tell me about what you see in this picture." These prompts encourage a child to formulate

a longer sentence in response to the story and allows the child an opportunity to contribute to the conversation that is not focused on short question-answer interactions. This prompt also encourages a child to attend to the details within the story.

The Wh- prompt encourages the reader to ask the child questions that begin with the words *what*, *where*, *when*, *why*, or *how*. Unlike the open-ended prompt, these questions require responses that range from single words (e.g., what would you call this?) to multiple words (e.g., why do you think that happened?). Wh- prompts have the benefit of encouraging conversation and of drawing a child's attention to new vocabulary words within the story.

The Distancing prompt requires the reader to converse with the child about how parts of the book relate to outside experiences. For example, in reading a book about a zoo, a reader might ask, "Have you ever been to the zoo? Tell me about that." Connecting a child's own experiences to the story helps a child link their world knowledge with emerging comprehension of stories. Additionally, these distancing prompts are likely to encourage extended conversation that benefits the child's understanding of the story.

## Phonemic Awareness

Phonemic awareness is the ability to analyze the sound structure of language; it is critical for acquiring decoding skills (Wagner & Torgesen, 1987). Early phonemic awareness instruction prevents reading failure in many children with or at risk for reading disabilities (Torgesen et al., 1999). Effective phonemic awareness instruction is explicit and systematic (National Institute of Child Health and Human Development, 2000); it requires the instructor to explain and model phonemic awareness skills such as phoneme segmentation, phoneme blending, and phoneme manipulation prior to guiding the child in practicing the skills (Rupley et al., 2009). Educators with strong phonemic awareness skills are able to properly model phonemic awareness skills and to respond appropriately to children's errors, but most educators' phonemic awareness skills are compromised by their knowledge of print (Moats, 2009; Spencer et al., 2008).

Phoneme segmentation requires an individual to "pull apart" the individual phonemes in a word. Example phoneme segmentation tasks are: "what are the sounds in /kip/?" and "how many sounds are in /kip/?" Children with strong phoneme segmentation skills are prepared to learn to match phonemes to graphemes (i.e., letters or letter patterns) and subsequently learn to decode (Ball & Blachman, 1988).

Phoneme blending requires an individual to "put together" individual phonemes to make a word. An example phoneme blending task would be: "what word do these sounds make? /k/-i/-p/?" Children with strong phoneme blending skills have stronger decoding skills because they can produce a complete word after "sounding it out" (Swank & Catts, 1994).

Phoneme manipulation requires an individual to add, remove, or switch phonemes in a word. An example phoneme manipulation task is: "What do you get if you say the sounds in 'keep' in reverse?" Phoneme manipulation

tasks are most sensitive to phonemic awareness weaknesses in children (Kilpatrick, 2012), and improving phoneme manipulation skill improves decoding (Simos et al., 2002; Torgesen et al., 2001).

## Professional Development for SLPs

SLPs receive graduate-level training related to receptive and expressive language assessment and intervention (inclusive of literacy) and should, on beginning their clinical practice, have knowledge of language and literacy development (Council for Academic Accreditation in Audiology and Speech-Language Pathology of ASHA, 2017). However, language and literacy are large constructs. Emerging evidence from studies of professional and preprofessional SLPs' explicit language knowledge indicates that even practicing SLPs may need support to master difficult concepts (Brimo & Melamed, 2017; Spencer et al., 2008). For example, Brimo and Melamed (2017) found that preservice SLPs were unable to match or count clauses in sentences (syntax knowledge) with more than 55% accuracy. Spencer et al. (2008) found SLPs, on average, identified sounds in words with a spelling-sound mismatch (e.g., think) with only 54% accuracy. It is possible that professional development could alter this professional knowledge, making it easier for SLPs to provide intervention.

Difficulties with foundational, explicit language knowledge likely translate to intervention practice patterns. Finestack and Satterlund (2018) surveyed grammatical intervention practice patterns for SLPs and found that grammatical interventions most often target plural -s and past tense forms for elementary school children but rarely target syntax. Schmitt et al. (2014) observed Individualized Education Plan goal alignment with observed student symptoms of language and literacy deficits in an elementary setting and found that of 29 students who exhibited symptoms of literacy difficulties, only two students had corresponding goals that targeted literacy-related skills. Thus, professional development may also be necessary to support SLPs in their implementation of interventions that address early literacy skills.

Studies of professional development for practicing SLPs are relatively limited (e.g., Overby & Rusiewicz, 2018; Mahowald & Rentmeester-Disher, 2019). Overby and Rusiewicz (2018) evaluated the impact of a problem-based learning workshop on SLPs' learning ( $n = 25$ ) about childhood apraxia of speech assessment and intervention. The professional development program included four consecutive, in-person training days with approximately 30 hr of learning activities. Outcomes were measured via an experimenter-created rubric completed by the instructors: overall, the study concluded that problem-based learning changes SLP skills and interactions. Mahowald and Rentmeester-Disher (2019) evaluated the effectiveness of a literacy-oriented, in-person professional development on the knowledge of 10 practicing SLPs. This professional development program included 24 hr of in-person instruction, 12 hr of online instruction, and 20 hr of assignments. Participant learning was measured via participant completion of concept maps, weekly logs of time

spent in literacy instruction, and observations. Results indicated that participant knowledge and time spent in literacy intervention changed from before to after the professional development course.

Although there are few studies of professional development for SLPs, there are many studies of the effects of professional development on other education professionals. The extant literature systematically documenting the effectiveness of literacy-oriented professional development varies with regard to target skill and program dose and dose frequency. A meta-analysis of language and literacy-focused professional development for early educators, for example, found an effect of professional development on instructional processes and interactions in the classroom and on physical classroom literacy environment but not on educator knowledge (Markussen-Brown et al., 2017). In particular, the meta-analytic work found that professional development changed the structural environment of the classroom the most (e.g., number of books available to the classroom) and affected measures of teacher-child interaction (coded as instructional processes). The authors speculated that the null finding for professional development on knowledge could reflect either the difficulty of the subject matter, given that language and literacy are complex topics, or the various ways that researchers choose to measure language and literacy knowledge. Importantly, this work supports the idea that knowledge and professional processes/interactions represent different constructs. Intervention intensity for studies included in this meta-analysis ranged from three workshop sessions to 30 workshop sessions plus 450 hr of coaching.

SLPs in the United States are required by their national certification board to participate in 30 hr of continuing education across 3-year periods (Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2020). Many choose to earn those hours in 1-time lectures and workshops, even though these types of learning experiences rarely are effective for establishing changes in practitioner behavior (e.g., Neuman & Cunningham, 2009). If SLPs are expected to engage in evidence-based interventions, the effectiveness of different forms of professional development programs for SLPs must be documented. Exploring the effectiveness of different models for providing continuing education hours on practice opens opportunities to consider how evidence-based practices can most quickly be translated to ongoing work with children.

Additionally, if we expect sustained success from professional development programs, those programs must address implementation barriers (Olswang & Prelock, 2015). Fulcher-Rood et al. (2020) explored school-based SLPs' perceptions of barriers to evidence-based practice and determined that the most-cited barrier was time. School-based SLPs typically have large caseloads and participating in a professional development program that includes many hours of additional work, such as the 56 hr provided in Mahowald and Rentmeester-Disher (2019), may not be feasible. This is particularly true if instruction time must be synchronous, whether online or in-person. Alternative modes of professional

development must be explored for practicing professionals. To expand the field's knowledge of the effectiveness of professional development programs, this study explored the effectiveness of two short-term, asynchronous, online training modules on two early literacy-related topics. One module addressed dialogic reading and the other addressed phonemic awareness.

Studies of online learning modules with preservice SLPs have found positive changes in students' knowledge and skills. Krimm et al. (2017) designed an online learning module that increases participants' knowledge of International Phonetic Alphabet symbols and basic transcription skills. Similarly, McDaniel et al. (2017) designed a brief module that effectively and efficiently teaches students to identify early communication acts (e.g., gestures). These positive findings with preservice SLPs suggest that brief online learning modules also may be effective for increasing in-service SLPs' knowledge and skills, though additional research is required to determine the specifics of effective online learning modules in speech-language pathology.

## This Study

The purpose of this study was to evaluate the efficacy of a short, asynchronous dialogic reading module and a short, asynchronous phonemic awareness module for teaching SLPs dialogic reading strategies and phonemic awareness skills, respectively. We answered the research questions:

1. Does completing the phonemic awareness module increase phonemic awareness?
2. Does completing the dialogic reading module increase knowledge of dialogic reading strategies?

## Method

The institutional review board approved the methods used for this study.

### Participants

Participants were SLPs ( $n = 28$ ; two males) who attended a research session at a conference for school-based SLPs in the Southern United States. One participant was a clinical fellow in speech-language pathology; all other participants were certified, licensed SLPs. All participants reported their education level had earned at least a master's degree; one participant reported holding an advanced degree beyond a master's degree. Five participants reported having taken coursework in reading methods and none reported structured literacy certification (e.g., Orton-Gillingham, International Dyslexia Association, Academic Language Therapy Association, Wilson Language Training). Mean age across participants was 38 years ( $SD = 11$  years) and mean years of experience working as an SLP was 10 years ( $SD = 7$  years;  $Mdn = 8$  years). For the study, participants were divided into two groups to receive the two different trainings. Years

of experience did not differ significantly between groups,  $t(25.28) = 0.12$ ,  $p = .90$ ).

### Procedure

Participants attended a research session entitled "Strategies for Supporting Language and Literacy with Dialogic Reading and Phonological Awareness" that was offered twice at a conference for school-based SLPs. Participants in the first session completed the phonemic awareness module ( $n = 13$ ) and participants in the second session completed the dialogic reading module ( $n = 15$ ). Participants did not know which module they would complete prior to attending. The session was held in a computer lab and all study activities were completed online. The first author and a research assistant were present to answer questions for informed consent, assist participants in accessing the study materials, and monitor that participants completed the assigned modules. Although they provided no instruction in dialogic reading strategies or phonemic awareness, the researchers' presence could have influenced participants' performance, particularly in terms of attention paid to the modules. Participants used the computers to access the informed consent document, grant consent, complete the pretest, complete their assigned module, and complete the posttest. Participants earned continuing education units for completing the module.

### Pretest and Posttest Measures

All measures were completed via a written online assessment administered using the Research Electronic Data Capture tool hosted at Vanderbilt University (Harris et al., 2009). Measures for each skill, dialogic reading and phonemic awareness, were administered to all participants before and after the training.

*Dialogic reading.* The dialogic reading assessment contained six questions that tap knowledge of dialogic reading strategies and is available in Appendix A. Participants first were asked "What is the acronym for the dialogic reading prompts?" (answer: CROWD). Next, they were asked to identify, from a choice of four, the prompt type represented by each letter in the CROWD acronym (e.g., "What does the C in CROWD stand for?" [answer: completion]). These questions were scored as correct or incorrect. The next five questions required participants to provide a prompt of a specific type for a given picture book page (e.g., "Give a C prompt for this page"; five questions). These responses were scored as correct (i.e., example of the requested prompt type) or incorrect by the first author and a graduate research assistant, both of whom were blind to condition and time while scoring the data. Participants could earn a score of up to 11 points in total.

*Phonemic awareness.* The phonemic awareness assessment contained questions that tap phoneme segmentation (10 questions) and phoneme manipulation (five questions) skills, both of which were targeted in the phonemic awareness module. The questions are available in Appendix B. For the phoneme segmentation questions, participants were asked to select all words, from a list of 10 words, that contain only



three phonemes. The 10 words were selected because they demonstrated strong item characteristics according to classical test theory (e.g., difficulty ranging from .4 to .7 and determination index greater than .4; Ebel & Frisbie, 1991) in the Spencer et al. (2008) sample. We selected only items with strong item characteristics to shorten the measure from the measure used by Spencer et al. (2008) while preserving the reliability of the measure. For the phoneme manipulation questions, participants were asked to choose, from a set of four possible answers, the word that results when the phonemes in a given word are reversed (e.g., “If you say ‘pay’ and then reverse the order of the sounds, ‘pay’ would be: (a) ape, (b) app, (c) yap, (d) yep”). Responses for phoneme segmentation and phoneme manipulation were scored as correct or incorrect. Participants could earn a score of up to 15 points total.

### Dialogic Reading Module

The dialogic reading module was created using Microsoft PowerPoint and was narrated by an adult, native English-speaking female. Participants accessed the module as a PowerPoint Story (.ppsx) file, which allows viewers to interact with the slide show. The module was designed to increase participants’ knowledge of the five dialogic reading prompt types: completion, recall, open-ended, wh-, and distancing questions (Whitehurst et al., 1988) and their ability to generate examples of each. The instruction followed a teach–model–coach–review approach based on Participatory Adult Learning Strategies (Dunst & Trivette, 2009; Roberts et al., 2014). Each prompt type was defined, and an example was given (teach). The module included a video of an adult engaging in dialogic reading with a preschool-aged child (model), followed by a slide that highlighted the prompts and prompt types the parent used. Participants then were asked to think of a prompt of each type for picture book pages and the module provided examples of prompts that the participant may have written for the participant to compare with his or her response (asynchronous feedback). Finally, the CROWD acronym was reviewed with a repetition of the definition of each prompt type (review).

### Phonemic Awareness Module

The phonemic awareness module was also created using Microsoft PowerPoint and was narrated by an adult, native English-speaking female. Participants accessed the module as a PowerPoint Story (.ppsx) file, which allows viewers to interact with the slide show. It targeted participants’ phoneme blending, phoneme segmentation, and phoneme manipulation skills. Like the dialogic reading module, the instruction followed a teach–model–coach–review approach based on Participatory Adult Learning Strategies (Dunst & Trivette, 2009; Roberts et al., 2014). Each targeted phonemic awareness skill (blending, segmentation, manipulation) was defined (teach) and an example was given (model). Participants completed interactive multiple-choice phonemic blending, segmentation, and manipulation tasks that provided immediate feedback on their performance (coach). For example, on an initial phoneme segmentation activity, participants were shown a picture of a shoe and

pictures of three answer options: ship, two, and sun, which the narrator verbally labeled. They were asked to select the picture for the word that starts with the same phoneme as shoe (correct answer: ship). Participants used the mouse to select their answer. Selecting the correct answer advanced the module to the next item; selecting an incorrect answer caused a box that said “try again” to appear on the screen. Finally, the definitions of the targeted phonemic awareness skills and the purpose of phonemic awareness instruction were reviewed (review).

### Scoring and Reliability

Questions that have straightforward correct/incorrect answers (e.g., what does the CROWD acronym stand for; which words contain only three phonemes?) were scored automatically using Microsoft Excel. The first author manually checked scoring on each item for 20% of (randomly selected) participants to ensure scoring accuracy. Item-by-item agreement was computed; no discrepancies were found. For open-ended questions scored as correct/incorrect (e.g., give a completion prompt for this page), the first author and a graduate research assistant, blind to testing time and condition, independently scored responses. Item-by-item agreement was computed (i.e., number of agreements divided by opportunities for agreement). Agreement was 96% and discrepancies were resolved by consensus as both scorers evaluated 100% of items.

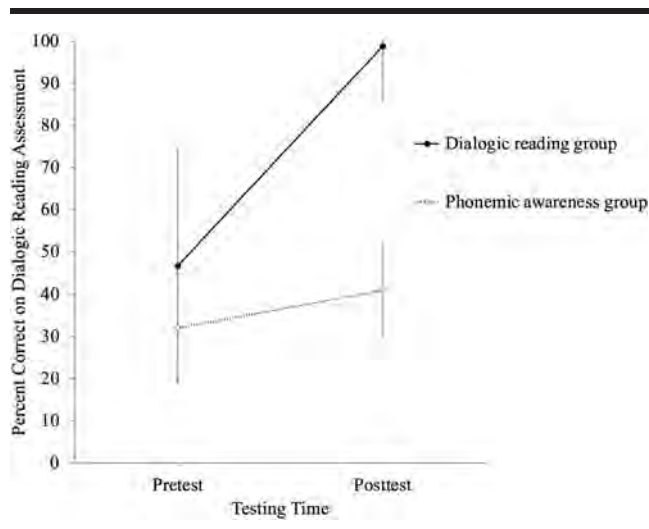
## Results

For both research questions, data were analyzed using multiple regression. For each regression model, the dependent variable was posttest score on the measure of interest, the independent variables were pretest score, group, and pretest score by group interaction. We selected multiple regression, which is statistically very similar to repeated-measures analysis of variance, because it better captures the effect of the continuous variables (pretest score and pretest score by group interactions) on the dependent variable (posttest score). The regression is arguably a simpler way to address that the pre- and posttest scores are highly correlated.

*Dialogic reading knowledge.* Figure 1 displays group performance at the pretest and posttest time points for participants’ knowledge of dialogic reading strategies. Note that for the dialogic reading variable, the phonemic awareness group served as a control group; they received a training that was functionally independent of the dialogic reading training. Data were analyzed using multiple regression. The dependent variable was posttest score on the dialogic reading measure. The independent variables were pretest score, group, and the pretest score by group interaction. All independent variables were statistically significant predictors of posttest score ( $\beta = -3.13, -3.40, 2.47$ , respectively; all  $p < .001$ ).

*Phonemic awareness.* Figure 2 displays group performance at pretest and posttest time points for SLPs’ phonemic awareness. Note that for the phonemic awareness variable, the dialogic reading group served as a control group; they

**Figure 1.** Pretest and posttest scores by group on the dialogic reading measure.

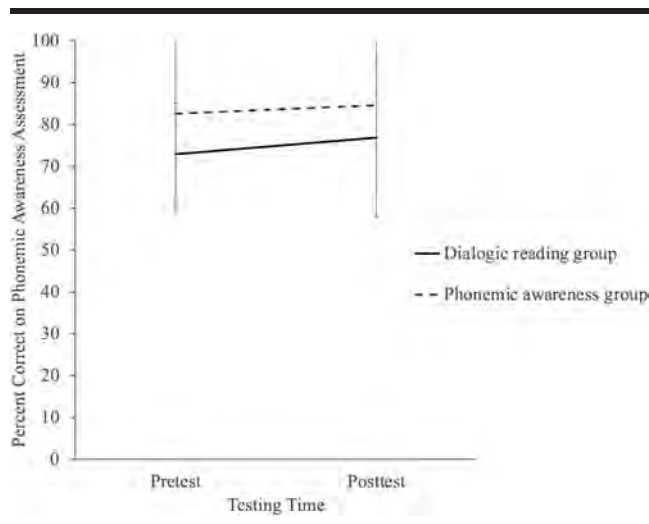


received a training that was functionally independent of the phonemic awareness training. Data were analyzed using multiple regression. The dependent variable was posttest score on the phonemic awareness measure. The independent variables were pretest score, group, and the pretest score by group interaction. None of the independent variables were statistically significant predictors of posttest score ( $\beta = -0.03, 0.06, \text{ and } -0.11$ , respectively; all  $p > .05$ ).

## Discussion

The purpose of this preliminary study was to explore the effects of short duration, online, asynchronous learning modules on practicing SLPs' knowledge and skills related to early literacy instruction. SLPs who completed the dialogic

**Figure 2.** Pretest and posttest scores by group on the phonemic awareness measure.



reading module improved their knowledge of dialogic reading strategies, whereas SLPs who completed the phonemic awareness module (i.e., the control group) did not. SLPs who completed the phonemic awareness module did not improve their phonemic awareness skills, neither did the SLPs who completed the dialogic reading module (i.e., the control group).

The different effects of the online training modules for dialogic reading and for phonemic awareness must be interpreted relative to the differences between these two topics. Dialogic reading is an intervention strategy that builds on a task: shared book reading. As an intervention strategy, dialogic reading can be explained and described as a specific, step-by-step protocol inclusive of an easy-to-recall acronym (e.g., Whitehurst et al., 1999). Phonemic awareness is less straightforward: recognition of sounds in words separate from their orthographic representation (e.g., knowing that *box* has four sounds but only three letters) cannot be reliably taught as a protocolized set of steps (e.g., Wagner & Torgesen, 1987). It is possible that a short-term module can effectively teach a protocol but not a skill like phonemic awareness.

The training effectiveness of the module for dialogic reading may also be related to the pretest knowledge of participants. Dialogic reading performance for both groups was less than 50% accurate at pretest, whereas phonemic awareness performance was above 70% accurate at pretest. Although groups' mean accuracy of 73%–76% does not reflect mastery of phonemic awareness (i.e., this would be a grade of “C” in an education setting), it is substantially higher than the accuracy of 55% reported by Spencer et al. (2008). Thus, for participants in the phonemic awareness module, there was less room for growth than for participants in the dialogic reading module. It is possible that a different group of SLPs with lower pretest scores would have shown a larger effect of the module.

Differences in SLP practice patterns and treatment norms within schools could also have influenced the differential effects of the modules. Schmitt et al. (2014) found that SLPs were most likely to set vocabulary goals for children who struggled with vocabulary (as compared to the number who set literacy goals for children who struggled with literacy). The authors speculated that SLPs' focus on vocabulary may have stemmed from vocabulary being a central educational and research focus within public schools over the past decades (e.g., Beck & McKeown, 2007; Biemiller & Boote, 2006). It is possible that school based SLPs are particularly attuned to the need for vocabulary intervention and were better primed to learn a vocabulary intervention (i.e., dialogic reading) than to improve their phonemic awareness skills.

The preliminary data from this study provide important, starting-point considerations related to professional development for SLPs. In particular, there are initial implications for the necessary dosage of professional development to start making changes in basic knowledge and for the role of feedback. The modules designed for this study were completed in a single, brief session. Both modules provided minimal opportunities for practice. In the dialogic reading module, participants were asked to think of an

example for each dialogic reading prompt type. In other words, they had a single opportunity to practice each prompt type. In the phonemic awareness module, participants had seven opportunities to practice phoneme segmentation, three opportunities to practice phoneme blending, and six opportunities to practice phoneme manipulation. The results suggest that the dialogic reading module provided sufficient practice for knowledge acquisition, whereas the phonemic awareness module did not. Indeed, participants who completed the phonemic awareness module provided feedback that they thought more opportunities to practice would be beneficial.

In addition to the amount of practice that the module provides, the schedule of practice also likely limited the phonemic awareness module's efficacy. Massed practice, as provided in the module, is generally less effective than distributed practice for skill learning (Mackay et al., 2002; Rosenbaum et al., 2001). Practicality drove our decision to design the phonemic awareness module with massed practice: the research study was to be completed in a single session. It is likely that adjusting the module to engage participants in a series of brief practice sessions across several days or even weeks (i.e., distributed practice) would be more effective than the single, longer session (i.e., massed practice) used for this study.

Although learning can occur in the absence of feedback, feedback that is (a) immediate, (b) intermittent, and (c) corrective improves learning (Kang et al., 2007; O'Reilly et al., 1994; Roedinger & Butler, 2011). The phonemic awareness module included immediate feedback, but feedback was continuous (i.e., occurred on every trial) and was not corrective. The consistent, noncorrective feedback may have contributed to the lack of improvement in phonemic awareness. First, continuous feedback has a deleterious effect on motor skill learning (O'Reilly et al., 1994); it is possible that this effect holds for nonmotor skill learning (e.g., phonemic awareness) as well. Second, the feedback in the phonemic awareness module simply indicated when participants' responses were incorrect. The module provided no additional information to scaffold participants' learning. Feedback that (a) illustrates why the correct answer is correct and/or (b) illustrates why the incorrect answer is incorrect would likely improve learning. For example, if a participant selected 3 as the number of phonemes in the word *box*, it may be useful to provide feedback that the phonemes in *box* are /b, a, k, s/ before asking the participant to try again. We hypothesize that such revisions would improve the module's efficacy.

Considered in the current context of continuing education for SLPs, the data from this study are important: for protocolized topics like dialogic reading, gains can be seen with a very short amount of training. A large number of SLPs engage primarily in single-session, seminar-style continuing education to meet licensure requirements (Council for Clinical Certification in Audiology and Speech-Language Pathology of the American Speech-Language-Hearing Association, 2020). Similar to this study, presenters of continuing education information typically only gauge learning gains in-session, rather than via follow-up to see if the session translated to at-work practices. It would be tempting

to assume, based on gains from the dialogic reading module in this study or from results from a single-session seminar, that SLPs can be trained on new practices in a very short amount of time. Our study validates that protocolized intervention knowledge can be trained that quickly; however, it is important to point out that we are not able to predict if that knowledge trickled down to better in-school practices. Next steps in the line of research must follow-up on that question. Time for training is a major barrier to SLP engagement in evidence-based practice (Fulcher-Rood et al., 2020). If short-term training, particularly online, asynchronous training that overcomes many time and distance barriers, can change practice, then this model of professional development should be pursued. If, on other hand, additional supports are necessary to translate this kind of training to practice, that is also critical information for schools to have.

### *Limitations and Future Directions*

This study provides important preliminary data to indicate that professional development does not necessarily need to take over 30 hr of SLP time, as required in previous studies, to result in knowledge gains. However, the limitations of this study also provide opportunities for future research to further explore how professional development can overcome barriers to have an impact on practice. One notable limitation is the small sample size obtained for this study. The primary risk of a small sample, however, is type II error (failure to reject a null hypothesis). Thus, despite the likelihood that the statistical analyses used in this study were underpowered, it is likely that the dialogic reading results would replicate with a larger sample. Most importantly, this study does not measure how participants continued to use any knowledge they gained during the modules. Future works must consider how short-term training translates to intervention in school settings.

A limitation of this study was that the module was provided at only one time point, not making full use of the potential benefits of online, asynchronous training. Carlson and Lund (2018) found an immediate increase in parents' use of dialogic reading strategies after an in-person training on which the dialogic reading module was based. Other studies of parent training (e.g., Lund, 2018; Roberts et al., 2014) also show immediate effects but not maintenance or generalization of short-term training on behavior. One advantage of online learning modules is that they provide more permanent learning opportunities than in-person sessions; participants can voluntarily return to online modules to refresh their skills. Furthermore, online learning modules can be designed to require repeated exposure to the material and frequent, brief reminders can be programmed into them. Future research should investigate whether online learning designed in this way can contribute to superior knowledge and skill maintenance compared to in-person learning opportunities.

The modules assessed in this study did not provide insight into ideal dosage and dose frequency for behavior change. This information is critical when considering how a professional development might be widely implemented.



Ideally, professional development is offered at the lowest dose and frequency that effects behavior change to overcome the time-related barriers associated with evidence-based practice implementation (e.g., Olswang & Prelock, 2015). Future studies of the phonemic awareness module will investigate whether adjusting the amount of practice, schedule of practice, type of feedback, and/or frequency of feedback will improve phonemic awareness in SLPs.

The dialogic reading module was effective for improving SLP knowledge of dialogic reading strategies. Because the module was based on a parent training paradigm, we expect that it also could be used clinically for increasing parent knowledge of dialogic reading strategies. Future studies could explore the effectiveness of online modules for parents as a way to promote dialogic reading strategy use across caregivers. Additionally, the utility of the module for other educators (e.g., preschool teachers) could be explored. Finally, future studies will examine the extent to which the improvement in SLP knowledge of dialogic reading strategies translates to improved use of the strategies in clinical practice and/or what additional supports are required to translate knowledge gains to sustained behavior change.

Short, asynchronous online learning modules may help alleviate the time pressure that is often cited as a barrier to effective professional development in speech-language pathology. They also align better with principles of adult learning than the traditional, one-day workshop model of professional development. This study provides preliminary evidence that asynchronous online learning modules may be effective for establishing basic knowledge of evidence-based practices. Additional research is warranted to determine the most effective means by which to implement online learning modules to spur SLP behavior change and improved intervention practices. Ultimately, online learning modules may be a viable means by which to promote evidence-based practices in speech-language intervention.

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## Appendix A

### Dialogic Reading Measure – Answers Are Bolded

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1. What is the acronym for the dialogic reading prompts? **CROWD**
2. What does the C in CROWD stand for?
  - a. **Completion**
  - b. Conclusion
  - c. Close reading
  - d. Cooperation
3. What does the R in CROWD stand for?
  - a. Remind
  - b. Recast
  - c. **Recall**
  - d. Reorganize
4. What does the O in CROWD stand for?
  - a. Ordering
  - b. **Open-ended**
  - c. Obvious
  - d. Other prompt
5. What does the W in CROWD stand for?
  - a. **'wh' prompt**
  - b. 'what if' prompt
  - c. 'wonder' prompt
  - d. 'why' prompt
6. What does the D in CROWD stand for?
  - a. Drawing conclusions
  - b. **Distancing**
  - c. Discussing
  - d. Details

For questions 7-11 participant are shown an image of a picture-book page.

7. Give a C prompt for this page.
  8. Give an R prompt for this page.
  9. Give an O prompt for this page.
  10. Give a W prompt for this page.
  11. Give a D prompt for this page.
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## Appendix B

### Phonemic Awareness Measure – Answers are Bolded

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1. Which of the following words have only three sounds? (1 point each)
    - yes**
    - ball**
    - thin**
    - stop
    - think
    - squirrel
    - quit
    - fox
    - start
    - knuckle
  2. If you say 'stow' and then reverse the order of the sounds, 'stow' would be:
    - a. watts
    - b. oats**
    - c. woes
    - d. outs
  3. If you say 'skate' and then reverse the order of the sounds, 'skate' would be:
    - a. tacks
    - b. take
    - c. takes**
    - d. cakes
  4. If you say 'talk' and then reverse the order of the sounds, 'talk' would be:
    - a. clot
    - b. clout
    - c. caught**
    - d. cat
  5. If you say 'owed' and then reverse the order of the sounds, 'owed' would be:
    - a. duo
    - b. dough**
    - c. dew
    - d. do
  6. If you say 'pay' and then reverse the order of the sounds, 'pay' would be:
    - a. ape**
    - b. app
    - c. yap
    - d. yep
-