Early Childhood Research Quarterly xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Early Childhood Research Quarterly

Letter sound characters and imaginary narratives: Can they enhance motivation and letter sound learning?

Theresa A. Roberts[a,*], Carol D. Sadler[b]

[a] Oregon Research Institute, United States
[b] CA State University, Sacramento, United States

ARTICLE INFO

Article history:
Received 2 June 2017
Received in revised form 15 March 2018
Accepted 4 April 2018
Available online xxx

Keywords:
Preschool
Motivation
Expectancy-value theory
Alphabet
Integrated mnemonics
Explicit instruction
Letter sounds

ABSTRACT

A total of thirty-eight preschool children were randomly assigned to one of two explicit teaching treatments to teach alphabet letter sounds. One treatment was designed to enhance motivation and learning by utilizing letters with letter sound characters integrated into the letter shapes (integrated mnemonics) and short narratives about the letter sound characters. In the treated control, plain letters and alphabet books were the foundation of instruction. There were no significant treatment effects on children's perceptions of ability or desire/interest for school tasks (cross-domain) or letters (domain-specific). Children's motivation increased significantly from pretest to posttest on three of four motivation measures including interest/desire for letters (domain-specific), and interest/desire and ability perceptions for school tasks (cross-domain). Effect sizes were $d_z = 0.50$, $d_z = 0.34$, and $d_z = 0.40$, respectively. There were significant treatment effects in favor of integrated mnemonics on identifying letter sounds, identifying initial consonants, and blending. Treatment effect sizes were $d = 1.31$ for letter sounds, $d = 0.61$ for initial phoneme identification (ID), and $d = 0.62$ for blending phonemes. Self-reports of ability and desire/interest for school tasks and letters were correlated with learning. Results are interpreted as suggesting that (a) identifying features of instruction that enhance motivation may require stronger instructional elements, increased alignment between features of instruction and measures, and improved measures, (b) small differences in the nature of letter sound instruction matter for learning with superiority for instruction including letter characters integrated into letter forms and imaginary narratives, and (c) relationships among motivation, learning, and instruction are discernible in preschool children.

1. Introduction

There is substantial evidence linking motivation to reading achievement (Guthrie & Wigfield, 2000; Morgan & Fuchs, 2007; Sweet, Guthrie, & Ng, 1998; Taboada, Tonks, Wigfield, & Guthrie, 2009). Motivation is defined in this paper as the psychological process that activates, directs, and sustains goal-directed behavior. The majority of studies showing this linkage between motivation and reading achievement have been conducted with grade 2 or older children. There are some studies demonstrating that as early as preschool and kindergarten motivation contributes uniquely to acquisition of early reading-related skills and is not simply a consequence of whether or not reading competence emerges easily or with difficulty (e.g. Chang & Burns, 2005; Dally, 2006; Kaderavek, Guo, & Justice, 2014; Lepola, 2004; Lepola, Lynch, Kuiru, Laakonen, & Niemi, 2016; Lepola, Poskiparta, Laakkonen, & Niemi, 2005; see Morgan & Fuchs, 2007, for review). The relationship between motivation and reading achievement in preschool children emerging from these few correlational studies provides an important reason why research to uncover the instructional features that may promote both motivation and literacy learning in preschool children is warranted.

There are additional reasons why investigating potential means by which preschool literacy instruction may promote literacy motivation and literacy learning is important. Academic expectations for preschool children have increased in tandem with increasing evidence that children's reading growth in kindergarten and beyond is influenced by their preschool language and literacy skills (Duncan et al., 2007; Ehri, 1998; Lonigan, Burgess, & Anthony, 2000; Snow, Burns, & Griffin, 1998; Wagner & Torgesen, 1987). Related reports identify the beneficial role that explicit instruction plays in effectively building many of these reading foundations (Camilli, Vargas, Ryan, & Barnett, 2010; National Early Literacy Panel, 2008; Nelson, Westhues, & MacLeod, 2003). Yet schol-

* Corresponding author.
E-mail address: robertst@csus.edu (T.A. Roberts).

https://doi.org/10.1016/j.ecresq.2018.04.002
0885-2006/

arly reports and articles aimed at teachers continue to question the importance of these skills and the explicit teaching of them (Casbergue, 2017, Moats, 2000; Paris, 2005; Teale, Hoffman, & Paciga, 2010). In addition, previous research has suggested that academically focused and explicit instruction targeting these foundations may have negative consequences on preschool children's motivation (Stipek, Daniels, Galluzzo, & Milburn, 1992; Stipek, Feiler, Daniels, & Milburn, 1995; Turner, 1995). Within the nexus of these concerns and possibilities, the question of how academically oriented preschool instruction might be designed to enhance literacy motivation and literacy learning arises. We know of only two studies where motivation-enhancing instruction was purportedly tested with young children. One was a quasi-experimental study of kindergarten science learning (Patrick, Mantzicopoulous & Samarapungavan, 2009). Kindergarten children's ($N = 162$) self-reports of science-related expectancy and value after participating in an inquiry science program comprised of content believed to be meaningful and interesting was compared to those of children receiving the business as usual science program. Children in the motivation-enhancing instruction reported greater competence in (expectancy) and liking of (value) science. Science learning was not evaluated. The one other study we found hypothesized that books comprised of picture-stories and activities where children selected and placed stickers related to the book topics on sheets would enhance attitudes toward reading (measured by number of pictures depicting a reading or non-reading activity that children chose from eighteen picture-pairs) compared with typical instruction (not described) with preschoolers (LePage & Mills, 1990). Attitudes toward reading were assessed at pretest and posttest, although no learning was evaluated. Teacher, classroom, and type of instruction were confounded in this study.

Accordingly, we designed explicit instruction to promote motivation and learning of letter sounds in preschool children and compared it to treated control instruction carefully matched on several dimensions. In designing instruction, we specified instructional components and learning activities that could be justified from both the motivation and letter-learning literatures as likely to increase motivation *and* learning. Letter sound knowledge was selected for instruction because of its importance for learning to read; the difficulty inherent in learning letter sounds; the limited evidence on how to effectively teach it; and teachers continuing uncertainty about its nature, value, and the instruction of it (Adams, 1990; McBride-Chang, 1999; O'Leary, Cockburn, Powell, & Diamond, 2010; Piasta & Wagner, 2010; Preschool Curriculum Evaluation Research (PCER) Consortium, 2008; Roberts, Vadasy, & Sanders, in press; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004).

There were three research questions investigated in this study:

1. Can explicit academic instruction designed to promote motivation and learning increase preschool children's motivation for school tasks and letters?
2. Can explicit academic instruction designed to promote motivation and literacy learning increase children's learning of letter sounds?
3. What are the relationships among cross-domain and letter-specific motivation and learning of letter sounds before and after participation in instruction?

To investigate these questions, a seven-week program of daily, letter sound instruction utilizing materials available in a classroom-ready format was delivered to whole-class groups of children within the regular instructional program. An experimental design with random assignment of children to treatment was utilized. The theoretical and empirical foundations related to these questions follows.

1.1. Instruction and motivation

Expectancy-value theory was selected as the motivation theory to frame the study. This choice was made to maintain consistency with previous preschool studies and because of evidence of the on-going richness of expectancy-value theories for studying motivation in achievement contexts (Atkinson, 1964; Conradi, Jang, & McKenna, 2014; Eccles, 1987; Wigfield & Eccles, 1992, 2000). Within expectancy-value theory, motivation is viewed as an interplay between an individual's expectations for success (expectancy) and the subjective attractiveness of some particular activity (value).

Confirmatory factor analyses have shown that expectancies and values are distinct from each other in studies of adolescents, elementary children, and first-graders (Arens, Yeung, Craven, & Hasselhorn, 2011; Eccles & Wigfield, 1995; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Marsh, Craven, & Debus, 1991). Additional studies showed that expectation of future success and self-perceptions of ability loaded on the same factor and were largely overlapping (Eccles, 1987; Eccles et al., 1993; Eccles & Wigfield, 1995; Eccles, Wigfield, & Schiefele, 1998; Wigfield & Eccles, 1992). This finding indicates that measuring children's perceived level of competence/ability on school and early literacy tasks can be used to gauge the expectancy component of their motivation. This was the method used in earlier preschool studies and the present investigation. In contrast, studies on the structure of the value component have revealed that older children and adults consider importance, utility, negative cost, and interest dimensions of tasks in determining its subjective, personal value. Eccles et al. (1998) and Wigfield and Eccles (1992) proposed that interest was the most important dimension of subjective task value for younger children. Therefore we measured children's self-reports of interest/desire in school tasks and letters to gauge the value component of their motivation.

Developmental change related to the expectancy and value components of children's motivation have been observed (Chapman & Tunmer, 1995; Chapman, Tunmer, & Prochnow, 2000; Dweck, 2002; Eccles et al., 1993; Gottfried, Fleming, & Gottfried, 2001; Wigfield et al., 1997; Wigfield, Eccles, Roesser, & Schiefele, 2008). Toddlers and preschool children develop self-evaluative capacities that influence motivation based on their emerging understandings of standards of mastery, feedback from others, and their own abilities. Young children tend to evaluate their competence positively, to be quite optimistic about their future performance, and to express positive valuing of school-like tasks (see Stipek & McIver, 1989, for review; Stipek, Roberts, & Sanborn, 1984).

Across time, children's expectancies and values become more domain specific with children as young as first grade reporting different levels of motivation in different academic domains (Chapman & Tunmer, 1995; Wigfield, 1994; Wilson & Trainin, 2007). This change is influenced by (a) experience with peers and schooling; (b) increasingly accurate self-perceptions; (c) classroom practices related to learning goals, evaluation, and autonomy support; and (d) level of interestingness, meaningfulness, and personalization of learning tasks. Reports of previous studies indicate inconsistency in when young children's motivation begins to become more domain-specific. Little is understood about how instruction in reading foundations may modulate the development and structure of motivation in preschool children. We reasoned that participation in instruction consistently focusing on a discrete skill such as letter sounds may hasten the development of letter-specific motivation that is related to letter learning. We investigate these questions in the present study. Specifically, we explore (a) relationships among expectancies, values, and literacy learning before and after instruction; and (b) the cross-domain and letter-specificity of expectancy-value motivation before and after instruction in children younger than those in previous studies.

There are methodological difficulties in studying motivation within expectancy-value and other theoretical frameworks. Difficulties arise because within almost every contemporary theory of motivation, motivation is conceptualized as an internal state derived from an individual's thoughts, beliefs, assessments, desires, goals, emotions, and intentions. These internal cognitive and affective states initiate, direct, sustain, and ultimately terminate activity. Consequently, the direct assessment of children's motivation involves the use of self-report scales, questionnaires, and interviews to identify motivation. In short, motivation influences behavior that leads to differences in learning. Specific behaviors such as persistence, challenge seeking, expression of affect, choosing, and attention are manifestations of motivation rather than direct measures of it and mediate the relationship between motivation and achievement. These behaviors may be observed (e.g. Berhenke, Miller, Brown, Seifer, & Dickstein, 2011; Chang & Burns, 2005) or estimated with methods such as teacher or parent ratings of behaviors and motivational states (e.g., Poskiparta, Niemi, Lepola, Ahtola, & Laine, 2003). For example, Berhenke et al. (2011) observed a number of motivation-related behaviors and emotions (persistence, shame) while Head Start graduates attempted to complete unsolvable and solvable puzzles and to answer questions that contained unknown vocabulary words in a laboratory-like setting. While asking parents and teachers to evaluate children's behavior, or inferring motivation from children's behaviors may appear to avoid the challenges of measuring self-perceptions and to adhere to conventional views that behavioral measures are more objective, they are more distal estimates of motivation than are children's responses about expectancies and values. The importance of the distinction between motivation and the behaviors that reflect it led Conradi, Jang, and McKenna (2014) to eliminate studies on engagement from their conceptual review of motivation.

The use of self-reports of motivation have been productively used in studies with preschool through first grade children although these studies probe a range of motivational constructs (Baroody & Diamond, 2012; Chang & Burns, 2005; Chapman, Tunmer, & Prochnow, 2000; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Smiley & Dweck, 1994; Stipek et al., 1995; Stipek, Roberts, & Sanborn, 1984; Stipek & Ryan, 1997; Wigfield, 1994; Wilson & Trainin, 2007). Baroody and Diamond (2012) found a relationship between literacy specific self-reports (children indicated their level of interest in reading, letters, and writing by selecting a smiling face, a neutral face, or a frowning face depicted on a response card) of 4-year-olds attending Head Start ($N = 81$) and standardized measures of letter-word identification and alphabet knowledge. Stipek and Ryan (1997) measured economically advantaged and disadvantaged preschool children's ($N = 233$) number and letter skills using items from standardized achievement tests. They measured motivation with childrens' self-reports of perceived competence (how good they were and how smart they were at numbers, art, and letters) and liking of school. Children indicated their selection on a response card of five circles of increasing size or of faces showing five different levels of positive affect. A complex pattern of significant relationships among motivation and cognitive outcomes was found. Economically disadvantaged children began and ended preschool with self-reported positive levels of motivation similar to those of more advantaged peers. In light of these conceptual considerations and to afford comparisons with previous preschool studies concluding that an academic focus and explicit instruction was detrimental to young children's motivation, we used self-report scales to directly assess preschool children's expectancies (How good are you at_________?) and valuing of school tasks and letters (How much do you want to do _______?).

Early correlational studies with preschool and kindergarten children probed children's self- expectancies and values and suggested that didactic instruction contributed to declines in motivation (Stipek, et al., 1992; Stipek et al., 1995, 1998). *Didactic* instruction was conceptualized as teacher-controlled and as focusing on academic skills. It is similar to current conceptualizations of explicit instruction. The classification into program type in these studies was based on classroom observations of child initiative, teacher warmth, positive control practices, and basic skills focus. Stipek et al. (1995) reported that children in a mixed sample of Latino, African-American, Asian, and white preschool children ($N = 226$, $n = 123$ preschoolers) who attended didactic programs reported lower perceptions of ability, less pride in their accomplishments, and more worry about school. Stipek et al. (1998) similarly measured preschool and kindergarten children's motivation with self- reports and standardized achievement measures. They augmented their previous work by including (a) experimenter ratings of dependence, affect, and persistence during a persistence task; (b) classroom observations of children's pride in accomplishment, help seeking, non-compliance, and affect; and (c) a one-year longitudinal follow-up. The findings among motivation, achievement, and classroom type were complex and varied. The authors concluded that basic skills programs had mostly negative effects on preschooler's motivation and cognition.

However, features of these studies render the results inconclusive. Teachers self-selected to type of preschool program and therefore teacher and program effects are not separable. There was no random assignment to program type. Only posttest data were analyzed. Literacy instruction was not specifically examined. In spite of these issues, these two studies were seminal because efforts were made to directly probe preschool children's motivation using self-report scales that served as the prototype for those developed for the present study. The studies continue to be cited in the literature and concern remains within the field of early childhood regarding the potential negative motivational consequences of explicit and academically oriented instruction (e.g. Bredekamp & Copple, 1997).

We reasoned that enhancing meaning, creating situational interest, and activating imagination would be instructional features to increase motivation. These features are essentially affective and therefore most likely to enhance the valuing component of motivation. Meaning is very salient to preschool children and may be promoted when letter sounds are associated with familiar objects (Authors, 2006; Levin & Tolchinsky-Landsmann, 1989) or when words containing target letter sounds are woven into an integrated narrative (Nelson, 1986). Enhanced meaningfulness has been found to benefit motivation in studies with older children (Cordova & Lepper, 1996; Hidi, 2001; see Renninger & Hidi, 2011, for review; Renninger, Hidi, & Knapp, 1992). Motivation may also be enhanced by the situational interest generated by the adventures of imaginary letter characters in short narratives (Fox, 1993; Hidi, 2001; Renninger, Ewen, & Lasher, 2002; see Schiefele, 2009, for review). Situational interest is a context-specific and affectively-positive orientation to an immediate experience such as hearing an interesting imaginary story. Evidence of preschoolers' ability to construct imaginary visual representations (Joh, Jaswal, & Keen, 2011) adds to the possibility that integrated letter-character images and stories of these character's adventures in an imaginary place called Letterland may promote motivation. We further reasoned that instruction leading to high levels of learning might increase children's self-perception of their competence, the expectancy component of motivation (Dweck & Bempechat, 1983; Chapman & Tunmer, 1995).

1.2. Instruction and literacy learning

Letter sound knowledge is a well-established foundation for literacy (Adams, 1990; Scarborough, 1990). Learning letter sounds may appear to be a simple association-learning task. However recent analyses of alphabet learning have detailed the challenges of learning subtle differentiations among letters shapes and their name or sound labels, and of learning what are initially meaningless and arbitrary associations among a large set of shapes and labels (Ehri & Roberts, 2006; Foulin, 2005; Nilsen & Bourassa, 2008; Roberts, 2017; Warmington & Hulme, 2012). Furthermore, reported levels of alphabetic learning across several preschool curricula and instructional approaches have been inconsistent and modest (Assel, Landry, Swank, & Gunnewig, 2007; Justice, Pence, Bowles, & Wiggins, 2006; Molfese, Beswick, Molnar, & Jacobi-Vessels, 2006; Preschool Curriculum Evaluation Research (PCER) Consortium, 2008; Piasta & Wagner, 2010). Letter sounds are particularly difficult to learn and yet are more predictive of learning to read than are letter names (McBride-Chang, 1999; Roberts, Vadasy, & Sanders, in press. Determination of more effective instruction to teach letter sounds is needed.

Integrated, or embedded, mnemonics is a promising approach for teaching letter sounds (de Graaf, Verhoeven, Bosman, & Hasselman, 2007; Ehri, Deffner & Wilce, 1984; Shmidman & Ehri, 2010). Integrated letter mnemonics are letter shapes embedded in a familiar action, object, or character. For example in the Letterland program (Manson & Wendon, 2003), the letter "d" is embedded in a picture of a duck named "dippy". The word "duck" contains the phoneme that the letter "d" typically represents. Three small-scale experimental studies have shown that integrated mnemonics promoted greater learning of letter sounds than did carefully matched alternatives (de Graaff et al., 2007; Ehri, Deffner, & Wilce, 1984; Shmidman & Ehri, 2010). In the Ehri et al. (1984) study 30 children whose average age was 69 months were individually taught letter sounds (Experiment 2). Children in one treatment learned letter sounds using integrated mnemonics. In one treated control treatment children learned the same letters that had been taught to the experimental group. Letters were presented with the same pictures, but the letter was not embedded in the picture. In a second treated control treatment, children learned the letters and the names of the associated object, but there were no pictures. Integrated mnemonics was more effective than either of the two control groups. Shmidman and Ehri (2010) replicated this finding in a within-subjects study in which 36, 5-year-old, English-speaking children were individually taught Hebrew. A number of benefits for integrated mnemonics were found including a Cohen's *d* effect size of 1.32 in favor of integrated mnemonics for learning letter sounds. The interpretation of these findings centered on the idea that integrated mnemonics help children remember and retrieve the links between letter shapes and their associated sounds by creating a meaningful and strong paired-association between them.

Dual coding effects may also be active in the benefits of integrated mnemonics because children receive information about letters in both pictorial and orthographic modalities (e.g. Sadoski, 2005; Sadoski & Paivio, 2001). The integrated pictogram may also support learning because the integration of the letter and letter character avoids the character becoming a "seductive detail" that can detract from learning (Mayer, Griffith, Jurkowitz, & Rothman, 2008). In the present study, letter shapes embedded in drawings of animal and human characters were used to teach letter sounds.

In successful letter sound learning, individual phonemes must be paired with written letter forms (Ehri, 2014). Strengthening children's learning of the phoneme label of the pair was focused upon by oral reading of imaginative and interesting narratives about these pictogram characters. Children identified initial phonemes in words embedded in these narratives. Identifying initial phonemes in spoken words is typically conceptualized as a phonemic awareness skill because children attend to and identify an individual phoneme heard at the beginning of a word. We believe this task may be seen as a component of letter sound learning because it strengthens the phoneme label component of paired associates between letter sounds and letter forms. Letter writing directs children's attention to the features of the print element of the pair (Diamond, Gerde, & Powell, 2008; Molfese et al., 2011; Puranik, Lonigan, & Kim, 2011). Strengthening children's learning of the written letter form was focused upon by letter-writing practice using the integrated letter and character images. When attention to the letter form is paired with the potential memory benefit of the mnemonic pictogram, a benefit to letter writing and to learning of letter sounds would be expected.

Based on this conceptual framework, integrated mnemonic pictograms of letter shapes embedded in letter characters, teacher readings of narrative stories about these letter characters, and letter writing utilizing the integrated mnemonic materials of the Letterland program (Manson & Wendon, 2003) were included in integrated mnemonics instruction. In the treated control, plain letters were used to introduce letter sounds, alphabet books were used to introduce words that began with letter sounds, and plain letters served as models for letter writing practice. By examining pretest and posttest motivation and literacy learning across the two treatments with children randomly assigned, teacher effects controlled, and frequency and intensity of instruction matched, we hoped to reliably determine the effect of letter sound instruction designed to enhance motivation and learning on both motivation and learning and to explore relationships among motivation, learning, and instructional experience.

2. Method

2.1. Participants

Thirty-eight children enrolled in a private preschool program were randomly assigned to one of the two treatment groups. Participant's mean age was 53.95 months. There were 17 girls and 21 boys. There were 10 males and 10 females in the integrated mnemonics treatment, and 7 females and 11 boys in the treated control group. Thirty-three children spoke only English and five were learning English as a second language (DLL). Four DLL children were in the integrated mnemonics condition and one was in the treated control condition. All parents or guardians gave consent for participation after receiving a letter describing the study. Children were estimated to be from predominantly middle class homes based on teacher reports, and the location of the school in a middle class neighborhood.

There were three preschool teachers with early childhood teaching licensure who shared teaching responsibilities for the total group of children. The preschool philosophy and curriculum was of a traditional, non-academic nature. Play, child-initiated activities, and socialization were emphasized. This view was articulated in a written statement of program philosophy provided to families of enrolled children. A variety of interest tables and art projects were available each day. Children were free to choose from available activities. Whole group read-alouds, lessons, and circle time were provided daily. No formal or systematic alphabet or writing instruction was provided prior to the study. The low pretest literacy scores (Table 1) are consistent with this program feature.

2.2. Measures

A trained graduate student administered pretest and posttest measures of motivation and literacy abilities according to standard-

Table 1
Simple (unadjusted) means and standard deviations by instructional condition.

Measure (Obs range)	Integrated mnemonics $n = 20$				Treated control $n = 18$			
	Pretest		Posttest		Pretest		Posttest	
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Cross-domain ability-school tasks (5–15)	10.53	(2.59)	11.65	(2.72)	9.67	(2.63)	11.06	(2.26)
Cross-domain desire/interest-school tasks (4–15)	11.59	(2.33)	12.25	(2.79)	10.67	(3.40)	12.50	(2.87)
Domain-specific letter ability (1–5)	3.43	(1.35)	3.40	(1.23)	3.17	(1.54)	3.22	(1.48)
Domain-specific letter desire/interest (1–5)	3.51	(1.47)	4.45	(0.89)	3.56	(1.62)	4.11	(1.82)
Letter sound ID: taught (0–13)	1.15	(2.23)	8.85	(2.97)	1.33	(2.72)	5.78	(4.19)
Letter sound ID: not taught	1.26	(2.50)	1.35	(2.41)	0.83	(2.26)	2.05	(2.48)
(0–9) Initial phoneme ID (0–10)	2.45	(2.76)	5.15	(3.31)	1.94	(3.21)	3.83	(3.71)
Phoneme blending (0–10)	3.25	(2.21)	5.70	(2.56)	3.11	(3.05)	4.44	(3.24)
Write letters and words (1–17)	6.71	(3.50)	8.65	(6.17)	7.22	(5.76)	7.81	(5.09)
Lowercase name ID (0–26)	6.75	(7.65)	8.10	(8.35)	10.44	(10.30)	11.56	(10.69)
Uppercase name ID (0–26)	7.50	(8.03)	10.55	(10.33)	10.83	(10.98)	13.67	(11.63)
Age in months (41–64)	53.47	(5.96)			53.90	(7.94)		

Note: $N = 38$ preschool children. Obs range = observed range of scores in the sample. ID = Identification.

ized instructions at a small table in the classroom. The motivation battery was administered first to minimize carryover effects from alphabet testing to motivation measures.

2.2.1. Motivation

Two scales based on expectancy-value theory similar to those used in previous studies with preschool children were designed. One scale measured children's perceptions of their competence/ability on school tasks (art, numbers, letters, and reading). A second measured their desire/interest for school tasks (art, numbers, letters, and classroom helper). Questions for the four items on each scale are shown in Appendix A.

Children were trained to respond to the motivation probes on each scale by selecting a cluster of one to five stars laid out in a graduated manner on a 6.5 in. × 26 in. piece of poster board. A single large, 1in. star was anchored on the leftmost side and was followed by groups of two, three, four, and five large stars spaced three inches apart. Children were trained to the meaning of the clusters. A practice question "Are you a fast runner?" was presented to train for the probes on the competence/ability scale. The question "How much do you like ice cream?" was used to train for the desire/interest scale. It was explained that one star represented *low competence/ability* ("a really slow runner") or a *low desire* ('don't like ice cream at all'), while choosing the group of five stars would mean really *high competence/ability* ("really fast runner") or *really high desire/interest* ("really love ice cream"). The clusters of two-four stars were explained accordingly as *medium-low* ("kind of a slow runner"; "like ice cream a little bit"), *medium* ("ok runner; run not too fast and not too slow"; "like ice cream ok") and *medium-high* ("pretty fast runner"; "like ice cream quite a bit"). Children indicated their selection by pointing to a cluster of one, two, three, four, or five stars. All children selected a group of stars and provided explanations consistent with their star selections on the practice items. Based on preliminary item analyses, item 4 that referred to reading (competence/ability) and classroom helper (desire/interest) was dropped from both scales in order to improve internal consistency and to ensure parallel content across the scales (Peterson, 1994). Possible scores summed across individual items were 0–15 (possible score of five for each of three items). This composite evaluated cross-domain expectancy and value. The item on each scale that probed children's expectancy and value related to letters was used to evaluate letter-specific expectancy (Appendix A, item 3). Single item scales can compare favorably to multiple item scales across a wide range of psychological dimensions including personality, moods and emotions, self-esteem, life satisfaction, and teacher observations of challenging behaviors. Evidence of reliability, correlations with multiple item scales, and predictive utility has been obtained for single item scales. Single item scales perform optimally when they are used to measure a concrete, narrow or, paradoxically, global construct and when multiple, equivalently "construct-related" items are hard to construct (e.g. Gardner, Cummings, Dunham, & Pierce, 1998; Robins, Hendin, & Trzesniewski, 2001). These conditions apply to the letter-specific construct in this study.

Scale reliability and validity were examined in three ways: Cronbach's coefficient alpha, factor analysis, and analysis of children's responses. Cronbach's alpha reliabilities for the ability and desires scales were .69 and .69. These estimates are the lower bound for true reliability (Sijtsma, 2009), and are consistent with the average .70 reliability coefficient for beliefs and value scales reported in a meta-analysis of Cronbach's alpha (Peterson, 1994) and other motivation studies probing children's self-perceptions (Arens, Yeung, Craven, & Hasselhorn, 2011; Cameron, Pierce, Banko, & Gear, 2005; Ecalle, Magnan, & Gibert, 2006; Jacobs et al., 2002; Patrick, Mantzicopoulos, & Samarapungavan, 2009; Stipek & Ryan, 1997; Wigfield & Guthrie, 1997).

Pretest and posttest exploratory factor analyses were computed to determine the extent to which children's responses on the ability perception and interest/desire scales loaded together consistent with the expectancy and value constructs within expectancy-value theory. Principal axis factoring with oblique rotation that allows the factors to be correlated was computed. The number of factors was set as two after examination of the scree test (which identifies the optimal number of factors based on initial eigenvalues for scale questions). The sample to variable ratio was approximately 6:1 falling within the acceptable range (Costello & Osborne, 2005; Preacher & MacCallum, 2002; Tabachnick & Fidell, 2001). At pretest, perceptions of art ability loaded with the interest/desire items (Table 3). At posttest, a two-factor solution was obtained with the perception of competence items and the interest/desire items clearly loading on separate factors, completely consistent with expectancy-value theory.

Analysis of children's selections of the groups of one to five stars provided further suggestion of scale validity. Individual children responded discriminately to the items on the scales. Summed across children, the full range of the one to five star ratings on each item on the expectancy and value scales was selected.

2.2.2. Alphabet knowledge

Children spoke letter names and letter sounds in response to a randomly ordered presentation of individual letters written on 2 in. × 3 in. cards for all 26 letters of the alphabet. All of the uppercase and lowercase names were assessed to measure prior alphabet knowledge. The uppercase letters were tested first to graduate task

Please cite this article in press as: Roberts, T. A., & Sadler, C.D. Letter sound characters and imaginary narratives: Can they enhance motivation and letter sound learning? *Early Childhood Research Quarterly* (2018), https://doi.org/10.1016/j.ecresq.2018.04.002

Table 2
Individual words from the initial phoneme and blending tests that began or did not begin with sounds included in instruction.

Letter sounds: taught	Initial phoneme test	Blending test
c		kind
a	apple	
m		milk, mouse
h	happy	
b	bite	boy
t	toy	
f	fudge	fly
r		
z		
y		
i		
v		
q		
Letter sounds: not taught	dinosaur,garage, chalk, nose, laugh	knee, paw, slap, slipper, sit

Table 3
Factor loadings at pretest and posttest for motivation exploratory factor analyses with oblique rotation.

Scale item	Pretest		Posttest	
	Factor 1	Factor 2	Factor 1	Factor 2
Ability perception art	0.82	−0.08	−0.17	0.63
Ability perception numbers	0.00	0.91	0.05	0.71
Ability perception letters	0.06	0.86	0.19	0.71
Desire/interest art	0.65	−0.14	0.85	−0.08
Desire/interest numbers	0.76	0.18	0.83	0.02
Desire/interest letters	0.64	0.15	0.73	0.12

difficulty. Only lowercase letter sounds were assessed because lowercase letter sounds are taught in the Letterland curriculum and to avoid subjecting children to an unnecessary test on which many were likely to perform poorly. Cronbach's alpha sample reliabilities were .89 (lowercase), .92 (uppercase) for the letter name task and .84 for the letter sound task. Possible scores for uppercase and lowercase letter names and lowercase letter sounds were 0–26.

2.2.3. The Phonological Awareness Test (PAT) (Robertson & Salter, 1997)

The initial consonant isolation (initial phoneme identification) and phoneme guessing (blending) subtests of this standardized measure were individually administered. Children were asked to identify the initial phoneme of one- to three-syllable words spoken by the examiner, and to blend and pronounce the resulting word for two to five phonemes spoken individually by the examiner. The PAT was selected because it is suitable for use with preschool children (Webb, Schwanenflugel, & Kim, 2004) and contains multi-item scales for both initial phoneme ID and blending (Table 2). Blending was included to test generalization of letter sound learning to a task closely related to learning to decode words. Cronbach's alpha sample reliabilities were .90 for initial consonant ID and .83 for phoneme blending. Possible scores for each scale were 0–10.

2.2.4. Letter and word writing

Children were instructed to write on a blank sheet of paper six letter sounds and five words dictated by the examiner (Puranik et al., 2011). A subset of taught (4 letters) and not taught (2 letters) were selected: a, t, m, s, d, and c. Familiar one- and two-syllable words comprised of taught letters (total 12 letters) and not taught letters (total 6 letters) in the initial and final position of the word were dictated: hat, leg, ant, rabbit, and kitten. Children were instructed to listen for the sounds in the words spoken by the examiner and to write the words with letters as best they could. An example using the word "sit" was modeled on a white board. Recognizable complete letters were scored 1 and recognizable partial letters were scored as .5. Word spellings were similarly scored for the number of correct, recognizable letters within them. Interrater reliability (Intraclass Correlation Coefficient) for all scores from two different scorers was .84 for the letter and word writing composite. Possible scores were 0–24.

2.3. Materials and procedure

Children were randomly assigned to one of the two treatment groups. Thirty-two lessons of 25-min duration were taught across seven weeks of instruction for each treatment (approximately 13 h of instruction). The length of lessons, number of lessons, and order of letter sounds was matched. In both experimental and treated control instruction, children were taught 13 lowercase letter sounds, heard and identified words containing the letter sounds at the beginning of words, and practiced writing letters. Instruction in the two treatment groups differed on three dimensions: (a) introduction of the letter sound with an integrated mnemonic pictogram of the lowercase letter (integrated mnemonics) or introduction of the lowercase letter in isolation with no pictogram (treated control), (b) hearing and identifying the target letter sound in initial position in words in an imaginary story about the pictogram character or hearing and identifying the letter sound in the same number of individual words depicted in an alphabet book (Szekeres, 1983), and (c) letter writing instruction paired with an integrated pictogram or paired with a lowercase letter with no pictogram (Table 4). The treated control was the counter factual for addressing whether or not the motivation-enhancing features of instruction influenced outcomes.

Two sets of 13 letters were balanced on features known to affect letter learning: position in the alphabet and whether or not the letter name includes the letter sound at the beginning or end of the letter name or not at all (h, y, g, and w). There were seven letters drawn from the first 14 letters of the alphabet in the taught and not taught sets and six letters from the second half of the alphabet in each set. The not taught sounds set is an additional counterfactual for examining whether the letter sound instruction was effective across treatments. The overall mean for taught letter sounds at pretest was $M = 1.24$, $SD = 2.44$ and was $M = 1.05$, $SD = 2.36$ for not taught letter sounds. Typical letter sounds and short vowels were taught for the following letters in the order listed: c, a, m, h, b, t, f, r, z, y, i, v, and q. Each letter was taught for two consecutive days. Two letters were introduced in each of six weeks with one letter introduced in the first week. Review lessons of all letter sounds previously taught were conducted on Friday of each week.

In each treatment, lessons were taught to the entire treatment group. The two treatments were conducted at the same time each day in different areas of the large preschool classroom where the preschool was located. Teaching spaces were separated by a kitchen and bathroom.

Two teachers were trained to deliver each treatment and alternated between the two treatment groups each week to control for teacher effects. The two teachers were Caucasian women and each had more than ten years teaching experience. One teacher possessed a BA degree, and the other had an AA degree. Both were state certified as an early childhood teacher. Fidelity of implementation and limiting of treatment diffusion was strengthened by teacher training, use of scripted lessons, and confirmed with structured observations of lesson delivery. One lesson from each instruction group was observed each week by a trained observer following the lesson script and checking off each instruction as it was given. Notes were made of any additional activities that were inserted. Ninety-four percent of the instructional elements were delivered in the treated control instruction group and ninety-five percent of the instructional elements were delivered in the inte-

Table 4
Detailed lesson sequence for each treatment group.

Integrated mnemonics	Treated control
(Standard 26 Lessons)	*(26 Lessons)*
1. Introduce Letter.	1. Introduce Letter.
2. "The name of this letter is ____"(Teacher shows plain letter card)	2. "The name of this letter is ____"(Teacher shows plain letter card)
3. "The Letterland character who lives in this letter is ____ and he/she makes the sound____"(Teacher shows pictogram.)	3. "The sound this letter makes is ____"(Teacher shows letter card)
4. Children repeat the sound.	4. Children repeat the sound.
5. Read Letterland character story. Discuss the words beginning with target sound, emphasizing their beginning sound.	5. Discuss the letter page of the alphabet book (Cyndy Szekeres' ABC). Discuss the pictured words beginning with the target sound, emphasizing their beginning sound.
6. Invite one student to wear the pictogram hat.	6. Invite one student to wear the letter hat.
7. Ask if the students know any other words beginning with __ letter sound. (up to five)	7. Ask if the students know any other words beginning with __ letter sound. (up to five)
8. Show the letter shape again.	8. Show the letter shape again.
9. Trace the letter shape and explain how to write it.	9. Trace the letter shape and explain how to write it.
10. Students trace the letter shape in the pictogram printed on their individual paper with their forefinger.	10. Students trace the letter shape printed on their individual papers with their forefinger.
11. Students write the letter shape on their own paper underneath the printed pictogram.	11. Students write the letter shape on their own paper underneath the printed letter.
12. Listen and write sheet. (Encourage careful listening) Teacher names each picture on the sheet emphasizing their beginning sounds. Students color all the pictures beginning with the same sound. (Emphasize that there is an odd one out).	12. Listen and write sheet. (Encourage careful listening) Teacher names each picture on the sheet emphasizing their beginning sounds. Students color all the pictures beginning with the same sound. (Emphasize that there is an odd one out).
(Review 6 Lessons)	*(Review 6 Lessons)*
1. Which Letterland characters have we met so far? Teacher immediately holds up letter pictograms one at a time and says, "The sound of this letter is___?"	1. Which letters have we learned so far? Teacher immediately holds up plain letter cards one at a time and says, "The sound of this letter is ___?"
2. Teacher shows the mnemonic pictogram and says, "What sound does this letter make?"	2. Teacher shows plain the letter card again and says, "What sound does this letter make?"
3. Students say each letter sound taught so far	3. Students say each letter sound taught so far.
4. Teacher repeats the above procedure for all the review letter.	4. Teacher repeats the above procedure for all the review letters.

grated mnemonics group. Less than six unscripted elements were added to lessons across treatments, and none of these additions were from the alternative lesson.

3. Results

Pretest demographics of the two treatment groups were compared with chi-square analyses (gender and dual language learner (DLL) status) and a *t*-test (age). There were no significant pretest differences between the two treatments on gender, DLL status, or age. *T-tests* comparing children's pretest performance on the motivation and literacy measures were computed. Pretest total scores on the expectancy (self-perceptions of ability for school tasks) and value (interest/desire for school tasks) scales, upper- and lowercase letter name ID, lowercase letter sound ID, initial phoneme ID, phoneme blending, and writing letters and words measures for the two treatments were compared. There were no significant pretest differences between treatments on the motivation or literacy measures although lowercase letter name ID scores were higher in the treated control instruction group, $t(34) = 1.73$, $p = .08$. The effect size was moderate; Cohen's $d = 0.41$. For this reason and because it is a measure of prior alphabet knowledge on which there was some variability, the pretest lowercase letter name score was used as a covariate in the analyses of treatment effects on the cognitive outcomes. Little's MCAR test for missing data was non-significant, $X^2(1, N = 36) = 36.083$, $p = .465$ indicating that the missing data (<2%) can be assumed to be missing completely at random. Values for missing data were imputed using multiple imputation (3 iterations) using a MCMC (Monte Carlo Markov Chain) algorithm.

Randomized control trials with a pretest–posttest design may be analyzed with univariate analysis of variance (ANOVA) wherein the pretest and posttest scores are treated as a within subjects, repeated measure. They may also be analyzed with univariate ANOVAs of posttest scores with the pretest score serving as a covariate (e.g. Dimitrov & Rumrill, 2003). The determination of which approach to use is constrained by research questions and power considerations, with analysis of covariance generally having more power (Van Breukelen, 2006). Change from pretest to posttest and treatment effects are estimated with the repeated measures option while only posttest treatment differences are estimated in the analysis of covariance option. Gauging motivational change associated with explicit instruction was an important research question generated by earlier studies. Therefore, univariate, repeated measures analyses only were performed for the motivation measures. While the main research question for the cognitive measures related to the posttest treatment effect, pretest to posttest change was also of interest. Therefore, both univariate repeated measures and univariate analysis of covariance were computed for each of the cognitive dependent variables. The results of the more conservative repeated measure option is reported and in cases where the findings are discrepant, the results of the analyses of covariance are also reported.

3.1. *Motivation results*

The data were examined prior to analysis for normality, homogeneity of regression slopes, and homogeneity of variance. Standardized residuals for each treatment were normally distributed at pretest and posttest for all four of the motivation dependent variables as assessed by Shapiro–Wilk's test (*ps* > .05). There was homogeneity of regression slopes for all four dependent variables (all *ps* > .05). Levene's test for equality of variances indicated that variances for pretest and posttest scores were not significantly different for all four motivation measures, all *ps* > .05.

To examine the effects of explicit, academically focused instruction on cross-domain and letter-specific expectancy and value constructs, four 2 (treatment) × 2 (pretest, posttest) repeated measures ANOVAs were computed. An ANOVA was computed for: (a) the composite of the three questions on the cross-domain expectancy scale (self-perception of ability in letters, numbers, and art); (b) the composite of the cross-domain value scale (interest/desire in letters, numbers, and art); (c) letter-specific

Please cite this article in press as: Roberts, T. A., & Sadler, C.D. Letter sound characters and imaginary narratives: Can they enhance motivation and letter sound learning? *Early Childhood Research Quarterly* (2018), https://doi.org/10.1016/j.ecresq.2018.04.002

expectancy question (item 3, "How good are you with alphabet letters?"); and (d) letter-specific value question (item 3, "How much would you like to do something with alphabet letters when I come back?"). There was no significant effect for treatment on any of the four ANOVAs: cross-domain expectancy $F(1, 36) = 1.07$, $p = .31$; cross-domain value $F(1, 36) = 2.21$, $p = .22$; letter-specific expectancy, $F(1, 36) = 0.38$, $p = .54$; and letter-specific value $F(1, 36) = 0.18$, $p = .68$. It should be noted that the single item letter-specific probes were included in the cross-domain composites.

Three significant effects for change in motivation from pretest to posttest were detected. Children's cross-domain desire/interest (value) for school tasks, $F(1, 36) = 4.72$, $p = .036$, Cohen's $d_z = 0.40$ and cross-domain ability perceptions (expectancy) for school tasks, $F(1, 36) = 6.59$, $p = .015$, Cohen's $d_z = 0.34$, were significantly higher after than before participation in either of two types of explicit instruction. Children's letter-specific interest/desire (value) also increased significantly from pretest to posttest, $F(1, 36) = 9.37$, $p = .004$, Cohen's $d_z = 0.50$. The p values remained significant after correction for multiple dependent variables with the Benjamini and Hochberg (1995) procedure. Children's letter-specific perception of ability was not significantly different at pretest and posttest, $F(1, 36) = 0.002$, $p = .97$, Table 5. Cohen's d_z estimate of effect size adjusts for the correlations between pretest and posttest scores.

3.2. Literacy learning results

The data were examined prior to analysis for normality, homogeneity of regression slopes, and homogeneity of variances. Standardized residuals for each treatment were normally distributed at pretest and posttest for the taught letter sound ID, initial phoneme ID, phoneme blending, and not-taught letter sound ID as assessed by Shapiro–Wilk's test ($p > .05$). Scores on the writing measure were significantly different from a normal distribution. There was homogeneity of regression slopes for all dependent variables (all $ps > .05$). Levene's test for equality of variances indicated that variances for pretest and posttest scores were not significantly different for taught letter sound ID, initial phoneme ID, phoneme blending, and not-taught letter sound ID, all $ps > .05$. Variance was significantly greater in the mnemonics treatment on the posttest writing measure; Levene's test for equality of variances $(1, 35) = 5.87$, $p = .020$. Therefore, a log transformation was applied to the writing measure. After transformation, Levene's test was no longer significant. All statistics for the writing measure were computed using the transformed values.

The main analyses to examine the effects of explicit, academically-focused instruction on literacy outcomes included five 2 (treatment) × 2 (pretest, posttest) repeated measures ANCOVA analyses with pretest letter name ID scores for the lowercase letters used as a background knowledge covariate. The five dependent variables were (1) taught letter sound ID, (2) initial phoneme ID, (3) phoneme blending, (4) letter and word writing composite (transformed), and (5) not-taught letter sound ID (the counterfactual for instructional content). The transformed descriptive statistics for the writing measure were converted back into the original scale to allow for meaningful interpretation and are reported in Table 6.

There was a significant Time × Treatment interaction for taught letter sound ID, $F(1, 35) = 19.80$, $p < .000$, and phoneme blending, $F(1, 35) = 5.70$, $p < .02$. Follow-up analyses to interpret the significant interaction with pretest lowercase letters again serving as a covariate revealed no significant treatment differences on these two dependent measures at pretest ($ps > .14$). At posttest there was a significant advantage for integrated mnemonics instruction over the treated control instruction treatment on taught letter sound ID, $F(1, 35) = 32.15$, $p < .000$, Cohen's $d = 1.31$; and phoneme blending, $F(1, 35) = 7.22$, $p = .011$, Cohen's $d = 0.61$. For initial phoneme ID,

Table 5
Estimated means, standard deviations, effect sizes, and confidence intervals for cross-domain and letter-specific motivation overall and by type of instruction.

Measure	Range	Overall						Integrated Mnemonics Instruction						Treated Control Instruction				
		Pretest		Posttest				Pretest		Posttest				Pretest		Posttest		
		M	(SD)	M	(SD)	ES[a]	95% CI[c]	M	(SD)	M	(SD)	ES[b]	95% CI[c]	M	(SD)	M	(SD)	95% CI[c]
Cross-domain ability – school tasks	(1–15)	10.09	(2.65)	11.35	(2.52)*	0.40	[9.14,10.93], [10.53,12.18]	10.51	(3.63)	11.65	(3.44)	0.17	[9.26,11.65], [10.54,12.79]	9.67	(3.81)	11.06	(3.63)	[8.41,10.93], [9.85,12.26]
Cross-domain interest – school tasks	(1–15)	11.17	(2.90)	12.37	(3.05)*	0.34	[0.26, 12.08], [11.47,13.28]	11.69	(2.31)	12.25	(2.79)	0.10	[10.61,12.95], [11.03,13.74]	10.67	(3.40)	12.50	(2.87)	[9.35,11.99], [11.00,14.05]
Domain-specific letter ability	(1–5)	3.10	(1.48)	3.32	(1.36)	0.12	[2.85,3.76], [2.88,3.74]	3.45	(1.38)	3.40	(1.20)	0.05	[2.81,4.10], [2.81,3.99]	3.17	(1.59)	3.22	(1.52)	[2.50,3.84], [2.60,3.85]
Domain-specific letter interest	(1–5)	3.54	(1.54)	4.28	(1.05)*	0.50	[3.05,4.03], [4.95,4.69]	3.52	(2.16)	4.45	(1.42)	0.22	[2.84,4.26], [4.15,5.08]	3.55	(2.21)	4.11	(1.48)	[2.84,4.27], [3.63,4.60]

Note: All means and effect sizes are based on model estimates.
[a] Cohen's d_z effect size from pretest to posttest.
[b] Cohen's d effect size between treatments at posttest.
[c] First 95% CI is for pretest, second is for posttest.
* Significant overall difference between pretest and posttest.

Table 6
Estimated means, standard deviations, effect sizes, and confidence intervals for letter sound identification, initial phoneme identification, phoneme blending, and writing by type of instruction.

Measure	Overall $N = 38$		Time Effect size	Integrated mnemonics $n = 20$			Treated control $n = 18$			Posttest Effect size
	M	(*SD*)	Cohen's d_z	*M*	(*SD*)	95% CI	M	(*SD*)	95% CI	Cohen's *d*
Letter sound ID (taught)										
Pretest	1.23	(2.19)		1.43	(2.84)	[0.49,2.37]	1.02	(2.96)	[0.34,2.01]	
Posttest	7.28	(2.25)[a]	2.85	9.40	(3.13)[b]	[8.37,10.43]	5.17	(3.30)	[4.08,6.26]	1.31
Initial phoneme ID										
Pretest	2.28	(2.86)		2.89	(3.98)	[1.57,4.20]	1.68	(4.20)	[0.30,3.07]	
Posttest	4.46	(2.62)[a]	0.97	5.61	(3.63)[b]	[4.41,6.81]	3.32	(3.84)	[2.05,4.59]	0.61
Phoneme blending										
Pretest	3.17	(2.45)		3.46	(3.40)	[2.34,4.58]	2.88	(3.86)	[1.69,4.07]	
Posttest	5.18	(2.45)[a]	1.08	6.27	(3.41)[b]	[5.15,7.40]	4.09	(3.60)	[2.90,5.27]	0.62
Write letters and words[c]										
Pretest	5.46	(1.69)		6.67	(2.06)	[4.87,8.35]	4.43	(2.14)	[3.48,7.06]	
Posttest	6.61	(1.71)[a]	0.68	8.02	(2.09)[b]	[6.07,10.70]	5.46	(2.21)	[3.55,8.44]	0.46
Letter sound ID (not taught)										
Pretest	1.03	(2.09)		1.52	(2.76)	[0.61,2.72]	0.54	(2.92)	[−0.42,1.50]	
Posttest	1.68	(1.61)	0.44	1.74	(1.96)	[1.09,2.39]	1.62	(2.07)	[0.94,2.30]	0.06

Note: All means and effect sizes are based on model estimates; ID = Identification.
[a] Pretest and posttest significantly different.
[b] Integrated mnemonics and treated control treatment posttest significantly different at $p < 0.05$ after multiple comparison correction.
[c] Log transformed means returned to the original scale.

there was a significant main effect for time, $F(1, 35) = 5.36$, $p = .027$, Cohen's $d_z = 0.97$; and for treatment in favor of integrated mnemonics; $F(1, 35) = 4.41$, $p = .04$, Cohen's $d = 0.61$. The Time × Treatment interaction effect was not significant. However, the ANCOVA for posttest initial sound ID with pretest initial sounds and pretest letter name ID scores as covariates revealed a statistically significant advantage for the integrated mnemonics treatment on posttest initial phoneme ID scores, $F(1, 35) = 5.58$, $p < .024$. Similarly on the repeated measures analysis of writing, there were significant main effects for time; $F(1, 35) = 4.92$, $p = .033$, Cohen's $d_z = 0.68$; and treatment, $F(1, 35) = 4.31$, $p = .046$; treated control $\mu = 4.90$, $SD = 2.00$; integrated mnemonics $\mu = 7.32$, $SD = 1.95$; Cohen's $d = 0.46$. The Time × Treatment interaction was not significant. For not-taught letter sound ID (the counterfactual for content of instruction) the repeated measures analysis revealed that there was no significant effect for time, $F(1, 35) = 0.013$, $p = .91$; or treatment, $F(1, 35) = 1.10$, $p = .30$; or the Time x Treatment interaction, $F(1, 35) = 3.30$, $p = .08$. After Benjamini and Hochberg (1995) corrections for multiple comparison were applied to the *p* values, posttest treatment effects for letter sound ID, phoneme ID, and blending remained significant. The *p* value for the treatment main effect on the writing measure ($p = .046$) fell just short of the critical *p* value of .04.

Frequency distributions for taught letter sound ID, initial phoneme ID, and blending scores by treatment provided descriptive insight on patterns of low performance in the two treatments. A criterion of scoring less than 25% on posttest letter sound ID (three or fewer letters), initial phoneme ID (two or fewer) and phoneme blending (two or fewer) measures was considered to indicate low performance. For taught letter sound ID, 38% of treated control instruction children scored three or less at posttest while there were no children in the integrated mmemonics treatment scoring at this low level. At pretest, these same percentages had been 89% and 90% for the treated control and mnemonics treatments, respectively. For initial phoneme ID, 44% of treated control children scored two or less compared to 35% of integrated mnemonics children. At pretest these percentages were almost identical at 89% and 90% for the treated control and mnemonics treatment, respectively. On the blending posttest, 33% of treated control instruction children and 5% of integrated mnemonics children scored two or less. At pretest, these children were 55% and 45% for the treated control treatment and mnemonics treatment, respectively.

3.3. Relationship between motivation and literacy skills results

Correlations were computed between cross-domain and letter-specific self-perceptions of ability (expectancy construct) and desire/interest (value construct) and literacy scores at pretest and posttest. There were 24 significant, moderate correlations among pretest and posttest expectancy, value, and literacy scores. Eighteen of the significant correlations were between posttest motivation and learning. The clearest pattern was that there was only one significant correlation (out of a possible 20) between children's pretest perceptions of ability (letter-specific and cross-domain) and either pretest or posttest measures of literacy abilities (Table 7, columns one and five). This pattern had changed at posttest such that there were nine significant correlations between perceptions of ability and measures of literacy ability (columns two and six) and these significant relationships included cross-domain and domain-specific indices. *Z* scores were computed for all correlations between pretest and posttest motivation for each of the five alphabet outcomes. Six of ten correlations between posttest letter-specific perceptions of ability and either pretest or posttest alphabet scores were significantly higher than at pretest (pretest taught letter sound ID, $z = 2.18$, $p = .015$; pretest initial phoneme ID, $z = 1.68$, $p = .048$; posttest initial phoneme ID, $z = 2.25$, $p = .012$; posttest not taught letter sound ID, $z = 1.85$, $p = .030$; pretest writing, $z = 2.26$, $p = .012$; posttest writing, $z = 2.60$, $p = .005$).

4. Discussion

Study findings extend previous research in four ways. First, the study is unique in that we designed instruction to simultaneously benefit preschool children's motivation and learning of letter sounds and rigorously tested the motivation and learning effects of the instruction with a randomized experiment. Instruction was based on the view that motivational features of meaningfulness, situational interest, and imagination in combination with cognitive processing to strengthen paired associate learning of each member of the pair (letter sound labels and letter forms) could work together as preschool children learned a basic skill. Although the motivational features included in instruction did not lead to significant increases in motivation in comparison to a carefully matched control, the study yielded insights about methodological improvements to benefit further research on how instruction

Table 7
Correlations among pretest and posttest motivation and literacy performance.

Measure Learning	Motivation: Letter ability pretest	Letter ability posttest	Letter interest-pretest	Letter interest-postttest	Cross-domain ability-pretest	Cross-domain ability-posttest	Cross-domain interest-pretest	Cross-domain interest-posttest
Taught sounds-pretest	0.07	**.41***	0.03	0.18	0.21	**.41***	0.02	0.25
Taught sounds-posttest	0.25	**.34***	0.21	**.38***	**.34***	**0.32***	0.12	0.29
Initial sound-pretest	0.05	0.28	**.37***	0.23	0.13	0.31	**.37***	0.28
Initial sound-posttest	0.02	**.33***	0.23	**.33***	0.17	**.46****	0.25	**.35***
Blending-pretest	0.08	0.23	**.40***	0.26	0.32	0.32	0.32	**.43***
Blending-posttest	−0.05	0.18	0.32	**.33***	0.11	**.33***	0.26	**.35***
Not taught sounds-pretest	0.13	0.28	0.18	0.25	0.25	**.34***	0.13	0.31
Not taught sounds-posttest	0.01	0.22	0.02	0.30	−0.02	0.19	−0.13	**.46****
Writing-pretest	0.10	**.37***	**.50****	0.18	0.29	**.34***	**.38***	0.26
Writing-posttest	−0.19	0.13	0.29	0.23	0.29	0.24	0.28	**.42****

* $p < 0.05$.

may foster motivation. Second, we investigated, with methodological improvement and with a specific focus on early literacy, the long-standing concern regarding potential negative motivational consequences of explicit, academically focused instruction for young children and found no evidence of motivational decline. Third, the findings extend evidence of the benefit of integrated mnemonics for taught-letter sound ID and initial phoneme ID (both of which were exercised during instruction) and blending (a related but not taught skill), and documented that substantial advantages for learning are achievable within whole group instruction typical of preschool classrooms and with classroom-ready commercial materials. Fourth, we extended the existing correlational studies on preschool motivation and literacy by exploring these relationships from before to after instruction and among cross-domain and letter-specific expectancies and values.

4.1. Instruction and motivation

We put forth a theoretically and empirically supported rationale that the letter characters and narratives utilized within the integrated mnemonics treatment would enhance motivation by increasing meaningfulness and situational interest, and activating imagination. We reasoned that these features would have their largest influence on the affective-based, value construct of expectancy-value theory and that expectancy as measured by perceptions of competence/ability would be enhanced due to greater learning. These ideas were not supported by statistical significance testing, although means trended in favor of the integrated mnemonics treatment.

However, the study does add to the literature with respect to motivation and instruction in clarifying that there was no evidence of motivational decline in preschool children participating in either of two types of explicit instruction designed to teach the academic skill of letter sounds. In fact, participation in either of two types of high-quality didactic instruction based on paired-associate learning principles integral to learning letters was associated with significant pretest to posttest increases in three of four cross-domain and domain-specific indices of motivation, the exception being letter-specific perception of competence/ability. The significant increases from before to after instruction cannot be unambiguously attributed to treatment because both treatment groups showed significant change. Alternative possibilities to treatment that could account for the significant overall change in children's motivation from pretest to posttest include that children's motivation naturally increased over time or children responded more positively on a second administration of the task because they understood it better. However, these global alternatives do not account for the fact that perceptions of letter competence/ability did not increase over time and that these perceptions were significantly more related to literacy skills at posttest than pretest.

4.2. Instruction and letter sound learning

Children's learning of letter sound correspondences in both treatments was noteworthy with large pretest-posttest Cohen's d_z effect sizes of 2.62 (integrated mnemonics) and 1.45 (treated control). In both treatments instruction included routines to promote paired-associate learning of letter sounds, practice identifying those sounds in whole words, and writing letters. The analysis of the counterfactual for the alphabet content that was taught (letter sound ID of letters not included in instruction) confirmed that posttest letter sound ID scores for letters not taught were not significantly higher than pretest scores, $F(1, 35) = .013$, $p = .91$. This result indicates that the significant pretest to posttest increase on letter sound learning across treatments resulted from instruction. Levels of letter sound knowledge in both treatments were markedly higher than those reported for both preschool and kindergarten children in other samples (Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998) and were accompanied by effect sizes notably larger than the average Hedge's $g = 0.24$ effect size for letter sound instruction reported in the most recent *meta*-analysis of alphabet learning (Piasta & Wagner, 2010).

Treatment comparisons in which the treated control was the counterfactual for the learning-enhancing letter character and imaginary story features of instruction showed that integrated mnemonics instruction was superior for learning on two of the three competencies emphasized in instruction: letter sound ID and initial phoneme ID of spoken words. Simply embedding letters within a depiction of a meaningful animal or human character accompanied with a name for the character and framing words that began with the target sound within an imaginative story about the character resulted in a large Cohen's $d = 1.31$ effect size on letter sound ID. Children who participated in integrated mnemonics instruction learned almost twice as many letter sounds as treated control children based on model-estimated means. We point out that letter sounds were tested with the letter isolated from the pictorial mnemonic and no fading procedure was implemented for the

Please cite this article in press as: Roberts, T. A., & Sadler, C.D. Letter sound characters and imaginary narratives: Can they enhance motivation and letter sound learning? *Early Childhood Research Quarterly* (2018), https://doi.org/10.1016/j.ecresq.2018.04.002

embedded character pictures (de Graaff et al., 2007). Therefore, the results suggest little interference from the embedding.

Integrated mnemonics children identified more than 1.5 times as many initial phonemes in meaningful whole words at posttest as did treated control instruction children. This finding is consistent with our a priori conceptualization that identifying initial phonemes in spoken words, a task typically considered to measure phonemic awareness, is sensitive to the utilization of letter sound knowledge in a manner similar to that required in learning to read words.

Children in the integrated mnemonics treatment heard words and identified the first sound in words that began with target phonemes within imaginary character narratives. In contrast, children in the treated control group heard and identified initial phonemes in the same number of words within alphabet books. The significantly greater scores on initial phoneme ID in the integrated mnemonics group based on the posttest ANCOVA analyses suggest the effectiveness of the imaginary narratives. It is also plausible that greater learning of letter sounds helped integrated mnemonics children's performance on the initial phoneme test in light of evidence of the reciprocal relationship between alphabet knowledge and phonological awareness in preschool and beyond (Lonigan et al., 2000; Perfetti, Beck, Bell, & Hughes, 1987). In this case, the results imply the importance of orthographic knowledge in phonemic awareness (Castles, Wilson, & Coltheart, 2011) because letter sound instruction included extensive exposure to printed letter forms. Finally, performance on the initial consonant ID task reflects some generalization of taught skills because four of the ten initial phonemes tested on the standardized PAT were not included in instruction.

Integrated mnemonics instruction also resulted in significantly higher achievement in comparison to the treated control on oral phoneme blending, a skill not taught during instruction. The associated effect size was $d = 0.62$. This finding constitutes additional evidence of the relationship between alphabet knowledge and phonemic awareness, and generalization of integrated mnemonics benefit.

Stability from preschool to elementary school in early literacy skills and evidence that early difficulties in reading foundations predicts later reading difficulties (Chapman et al., 2000; Lonigan et al., 2000) led us to explore how children at the lower end of the learning distribution fared at posttest. Low performers were defined as those children having a score of 25% or less on a measure. This exploration suggested that children in the integrated mnemonics group fared better than those in the treated control group. There were 38% (letter sounds), 30% (blending), and 5% (initial phonemes) more low performers in the treated control treatment. Notably, there were no low performers in the integrated mnemonics group on letter sound ID. These frequencies suggest that integrated mnemonics instruction was protective against low learning of instructional content.

Instructional routines hypothesized to lead to learning were derived by the analysis of the cognitive processes involved in learning letter-sound correspondences and initial phoneme ID. From these analyses, similar to that of other researchers, we concluded that learning letter sounds is essentially a paired-associate memory task (Nilsen & Bourassa, 2008; Warmington & Hulme, 2012) and therefore instruction to strengthen paired-associate learning by using integrated mnemonics, sufficient practice, and review should be beneficial (Shmidman & Ehri, 2010). The narrative structure, which is very familiar to preschool children (Nelson, 1986), of letter character stories might have helped children establish integrated networks among exemplar words and to connect these words with each story narrative. This integration could improve memory for words, helping children to more readily isolate initial phonemes in them. This analysis suggests that simple association learning (often characterized as lower level and meaningless drill) and instructional features such as meaningfulness and narrative (often more positively characterized as higher order and authentic) worked in tandem during explicit instruction to assist children in learning what was taught with evidence of generalization to related skills.

The findings demonstrate that preschool children's learning to associate many letter shapes with their spoken sounds and to utilize this knowledge to isolate initial phonemes in spoken words is responsive to even small variations in the manner in which instruction activates task-related and apparently powerful learning processes of preschool children. We emphasize that the superiority of the integrated mnemonics group was in comparison to carefully matched alternative instruction rather than a business as usual or untreated control group.

Letter writing instruction was included to sharpen children's knowledge of the letter form part of letter-sound correspondence pairings and to potentially capitalize upon the reciprocal nature of reading and spelling in preschool foundations for each: letter sounds and letter writing (Diamond, Gerde, & Powell, 2008; Ehri, 2000; Molfese et al., 2011; Puranik et al., 2011). The sensitivity of the writing measure to treatment may have been insufficient because taught- and not-taught letters were included on it. We speculate that another influence that weakened treatment effects on writing may have been that our measure included word writing, a task likely beyond the ability of preschool children who received a modest amount of individual letter-writing instruction and practice.

4.3. Relationships among motivation, learning, and instruction

The exploration of relationships among indices of motivation and learning add to a growing body of research documenting interplay between motivation and early literacy achievement in preschool children (e.g. Lepola, Poskiparta, Laakkonen, & Niemi, 2005) and extends this literature by suggesting that instructional experience may contribute to the interplay. There were reliable, moderate relationships among letter-specific and cross-domain expectancies and values, and early literacy at pretest and posttest. The magnitude of these correlations is in the higher range of those reported between motivation and learning in the 15 studies reviewed by Morgan and Fuchs (2007) that included mostly children older than preschool. In the present study, between 10% and 25% of the measured variance was accounted for by these associations. The moderate and reliable relationships, although not universally present, between motivation and literacy skills are consistent with other research (e.g., Baroody & Diamond, 2012; Chapman & Tunmer, 1995) and the idea that these linkages are emerging in preschool children.

Teaching and learning experiences across a short seven-week period were associated with some calibration of letter-specific perceptions of competence/ability such that it was significantly more related to several measures of early literacy at posttest than pretest. These findings suggest that after participation in instruction specifically related to letters, preschool children exhibit letter-specific expectancies related to their performance earlier than has been reported in previous research (Valeski & Stipek, 2001; Wigfield et al., 1997). Children's pretest views of their letter competence/ability were not related to either pretest or posttest literacy performance and there was only one positive correlation between their pretest perceptions of ability across school tasks and posttest literacy scores. Young children may have initially been unable, not inclined, or in possession of too little literacy knowledge to accurately gauge their literacy abilities, leading to limited correlation between pretest expectancies and literacy scores.

There were more positive correlations between interest/desire and learning both before and after instruction than between competence/ability and learning at both time points (Table 7, columns two, four, six, and eight). This pattern is consistent with previous evidence that young children make use of affective value information before they demonstrate using personal ability information (Stipek, Recchia, et al., 1992). In addition, after instruction the two-construct structure of expectancies and values was represented clearly in the self-report data.

In summary, preschool children have motivation-related thoughts that are theoretically and empirically related to literacy competence. These thoughts are cognitively organized into expectancies and value constructs, consistent with the expectancy-value theory of motivation. Participation in skill-focused and explicit instruction may shape these relationships such that competence/ability perceptions specific to what was taught become more aligned with actual performance. Interpretation of these patterns of association requires caution because they were based on correlations and were not found on all measures. We have considered these correlations through the lens of expectancy-value theory. Other interpretations for the greater number of posttest correlations and even for the significantly greater correlations at posttest than pretest that were found on letter-specific perceptions of competence/ability are possible.

4.4. Limitations

There are measurement challenges in studying motivation because theories hold that motivation is an internal state shaped by children's perceptions. This study is no exception. We took as a starting point motivation measures used in previous studies with young children. Although we trained children to use a scale designed to give concrete representations to their thinking and affect and all children gave plausible explanations for their selections on training items, reliability for the scales was not strong. There was some ceiling effect on the measure of desire/interest for letters, particularly in the integrated mnemonics group ($M = 4.45$), limiting the possibility of detecting a treatment effect. Understanding of the relative utility of single-item and multi-item self-report scales for use with young children would advance the study of early childhood motivation. Clearly, work is needed to develop motivation self-report scales with strong psychometric properties for use with young children.

The exploratory and correlational nature of the reported relationships amongst motivation and early literacy skills limits the extent to which interpretations and conclusions related to children's motivation can be drawn from them. This caution applies especially to the changing relationships observed from pretest to posttest. The presence of other possible factors contributing to pretest to posttest change such as maturation or better understanding of the motivation task demands must be considered.

While specifying multiple instructional elements for promoting motivation and learning strengthened the theoretical justification for instructional design, they present challenges for interpretation. It is not possible to identify clearly how individual instructional routines (paired associate learning, isolating initial phonemes in words, writing) influenced learning. Similarly, it is not possible to identify how meaningfulness, interest, imagery value, and imagination individually influenced motivation and learning. Meaningfulness, interest, and imagery value are highly correlated (Reynolds & Paivio, 1968), creating further challenges for theoretical and empirical distinctions among them. Measurement of association and imagery processing abilities, and children's valuing and thoughts about the instructional materials may have helped elucidate why integrated mnemonics and imaginary stories were superior.

The sample was limited to children from middle-income families precluding generalization to children from lower-income families who are among the most vulnerable for experiencing literacy-learning challenges (Harris, Robinson, Chang, & Burns, 2007) although few differences in motivation between young children from lower- and middle-class families have been found (Howse, Lange, Farran, & Boyles, 2003; Stipek & Ryan, 1997). The low to very low initial levels of alphabet knowledge mitigates this concern to some degree. We selected children from this demographic to increase the likelihood of being able to develop language-based self-report scales with sufficient reliability for investigating motivation and yet our measures had just acceptable reliability and we did not detect treatment effects on motivation. The sample size was small increasing the risks of unstable estimates of effects, increased error, and limitations in detecting reliable effects.

4.5. Educational implications

A general implication of the finding that small differences in explicit instruction strongly influenced literacy learning is that attention to the details of instructional routines within preschool curricula for teaching letter sounds and related skills is important. Small-scale, experimental studies with tightly controlled instructional variables are useful for detecting these details. In addition, one consideration in selection of preschool curriculum materials should be whether letter sound teaching materials contain integrated mnemonics and engaging stories with exemplars of words containing target letter sounds. Preschool teachers can be encouraged to teach explicitly letter sounds using integrated mnemonics and to embed target letter sounds within words in interesting and imaginative stories with anticipation of positive motivation and learning outcomes for children. The practical significance of the findings is enhanced by the availability of the Letterland materials used in this study for classroom use and the fact that the instruction was effective in group settings of 18–20 children. The growing relationship between perceptions of letter-specific competence/ability and early literacy learning suggests the potential importance of early response to preschool children experiencing early difficulty in literacy learning for possible prevention of motivational decline. The correlational nature of this exploratory finding recommends restraint in the confidence ascribed to this possibility.

4.6. Future research

The fact that treatment effects on motivation were not detected prompts us to comment on how our exploration of designing instruction to promote motivation and learning may contribute to future research, beyond the issues noted in the limitations. We suggest that the absence of treatment effects on motivation points to the need for a comprehensive and treatment-focused approach to measuring motivation. More treatment sensitive probes in the self-reports coupled with observations of children's behaviors that mediate motivation and achievement such as demonstration of positive affect and persistence during instruction, and a task in which children were asked to choose treatment-specific or other materials in a forced-choice setting would have been a strong approach. These sources of evidence would need to be carefully triangulated such that the child self-reports, which are the most direct assessment of motivation, have a prominent role. Such an approach may be especially needed with samples of children such as dual language learners or children from low-income families who may not possess the English language skills to respond meaningfully to the type of probes used in this study. The clear evidence for the superiority of integrated mnemonics for learning letter sounds, evidence of some generalization of this learning, and the methodological and substantive insights gained with respect to the possibility of designing instruction to enhance motivation encourage additional experimental research to discover ways in which both motivation and learning of early literacy skills may be promoted in instruction.

Appendix A. Questions for the Self-perceptions of Ability and Interest/Desire for Learning Tasks Scales

Self- perceptions of ability scale:

1. How good are you at drawing and art?
2. How good are you with numbers?
3. How good are you with alphabet letters?
4. How good are you at reading?

Interest/desire for alphabet and other learning tasks scale:

1. How much would you like to do something with numbers when I come back?
2. How much would you like to do something with drawing and art when I come back?
3. How much would you like to do something with letters when I come back?
4. How much would you like to clean up the classroom when I come back?

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.
Arens, A. K., Yeung, A. S., Craven, R. G., & Hasselhorn, M. (2011). The two-fold multidimensionality of academic self-concept: Domain specificity and separation between competence and affect components. *Journal of Educational Psychology*, *103*, 970–981. http://dx.doi.org/10.1037/a00025047
Assel, M. A., Landry, S. H., Swank, P. R., & Gunnewig, S. (2007). An evaluation of curriculum, setting, and mentoring on the performance of children enrolled in pre-kindergarten. *Reading and Writing: An Interdisciplinary Journal*, *20*, 463–494. http://dx.doi.org/10.1007/s11145-006-9039-5
Atkinson, J. W. (1964). *An introduction to motivation*. Oxford, England: Van Nostrand.
Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society*, *57*, 289–300.
Berhenke, A., Miller, A. L., Brown, E., Seifer, R., & Dickstein, S. (2011). Observed emotional and behavioral indicators of motivation predict school readiness in Head Start graduates. *Early Childhood Research Quarterly*, *36*, 430–441. http://dx.doi.org/10.1016/j.ecresq.2011.04.001
Baroody, A. E., & Diamond, K. E. (2012). Links among home literacy environment, literacy interest, and emergent literacy skills in preschoolers at risk for reading difficulties. *Topics in Early Childhood Special Education*, *32*, 78–87. http://dx.doi.org/10.1177/0271121410392803
Bredekamp, S., & Copple, C. (Eds.). (1997). *Developmentally appropriate practice in early childhood programs (Rev. Ed.)*. Washington, DC: National Association for the Education of Young Children.
Cameron, J., Pierce, W., Banko, K. M., & Gear, A. (2005). Achievement-based rewards and intrinsic motivation: A test of cognitive mediators. *Journal of Educational Psychology*, *97*, 641–655. http://dx.doi.org/10.1037/0022-0663.97.4.641
Camilli, G., Vargas, S., Ryan, S., & Barnett, W. (2010). Meta-analysis of the effects of early interventions on cognitive and social development. *Teachers College Record*, *112*, 579–620.
Casbergue, R. M. (2017). Ready for kindergarten? Rethinking early literacy in the common core era. *Reading Teacher*, *70*(6), 643–648. http://dx.doi.org/10.1002/trtr.1569
Castles, A., Wilson, K., & Coltheart, M. (2011). Early orthographic influences on phonemic awareness tasks: Evidence from a preschool training study. *Journal of Experimental Child Psychology*, *108*, 203–210. http://dx.doi.org/10.1016/j.jecp.2010.07.006
Chang, F., & Burns, B. M. (2005). Attention in preschoolers: Association with effortful control and motivation. *Child Development*, *76*, 247–263. http://dx.doi.org/10.1111/j.1467-8624.2005.00842.x
Chapman, J. W., & Tunmer, W. E. (1995). Development of young children's reading self-concepts: An examination of emerging subcomponents and their relationship with reading achievement. *Journal of Educational Psychology*, *87*, 154–167. http://dx.doi.org/10.1037/0022-0663.87.1.154
Chapman, J. W., Tunmer, W. E., & Prochnow, J. E. (2000). Early reading-related skills and performance, reading self-concept, and the development of academic self-concept: A longitudinal study. *Journal of Educational Psychology*, *92*, 703–708. http://dx.doi.org/10.1037/0022-0663.92.4.703
Conradi, K., Jang, B. G., & McKenna, M. C. (2014). Motivation terminology in reading research: A conceptual review. *Educational Psychology Review*, *26*, 127–164. http://dx.doi.org/10.1007/s10648-013-9245-z
Cordova, D., & Lepper, M. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology*, *88*, 715–773. http://dx.doi.org/10.1037/0022-0663.88.4.715
Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation*, *10*, 1–9 [Retrieved from]. http://pareonline.net/pdf/v10n7a.pdf
Dally, K. (2006). The influence of phonological processing and inattentive behavior on reading acquisition. *Journal of Educational Psychology*, *98*, 422–437. http://dx.doi.org/10.1037/0022-0663.98.2.420
de Graaff, S., Verhoeven, L., Bosman, A. M., & Hasselman, F. (2007). Integrated pictorial mnemonics and stimulus fading: Teaching kindergartners letter sounds. *British Journal of Educational Psychology*, *77*, 519–539. http://dx.doi.org/10.1348/000709906X160011
Diamond, K. E., Gerde, H. K., & Powell, D. R. (2008). Development in early literacy skills during the pre-kindergarten year in Head Start: Relations between growth in children's writing and understanding of letters. *Early Childhood Research Quarterly*, *23*, 467–478. http://dx.doi.org/10.1016/j.ecresq.2008.05.002
Dimitrov, D., & Rumrill, P. D., Jr. (2003). Speaking of research. Pretest–posttest designs and measurement of change. *Work*, *20*, 159–165.
Duncan, G. J., Claessens, A., Huston, A. C., Pagani, L. S., Engel, M., Sexton, H., et al. (2007). School readiness and later achievement. *Developmental Psychology*, *43*, 1428–1446. http://dx.doi.org/10.1037/0012-1649.43.6.1428
Dweck, C. S. (2002). The development of ability conceptions. In A. Wigfield, & J. Eccles (Eds.), *Development of achievement motivation* (pp. 57–88). San Diego, CA: Academic Press.
Dweck, C. S., & Bempechat, J. (1983). Theories of intelligence and achievement motivation. In *Learning and motivation in the classroom*. Hillsdale, NJ: Erlbaum.
Ecalle, J., Magnan, A., & Gibert, F. (2006). Class size effects on literacy skills and literacy interest in first grade: A large-scale investigation. *Journal of School Psychology*, *44*, 191–209. http://dx.doi.org/10.1016/j.jsp.2006.03.002
Eccles, J. A. (1987). Gender roles and women's achievement-related decisions. *Psychology of Women Quarterly*, *11*, 135–172. http://dx.doi.org/10.1111/j.1471-6402.1987.tb00781.x
Eccles, J. A., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin*, *21*, 215–225. http://dx.doi.org/10.1177/0146167295213003
Eccles, J. A., Wigfield, A., Harold, R., & Blumenfeld, P. B. (1993). Age and gender differences in children's self- and task perceptions during elementary school. *Child Development*, *64*, 830–847. http://dx.doi.org/10.2307/1131221
Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In W. Damon, & N. Eisenberg (Eds.), *Handbook of child psychology* (Vol. 3) (5th ed., Vol. 3, pp. 1017–1095). New York: Wiley.
Ehri, L. C. (1998). Grapheme-phoneme knowledge is essential for learning to read words in English. In J. Metsala, & L. Ehri (Eds.), *Word recognition in beginning literacy* (pp. 3–40). Mahwah, NJ: Erlbaum.
Ehri, L. C. (2000). Learning to read and learning to spell: Two sides of a coin. *Topics in Language Disorders*, *20*, 16–36. http://dx.doi.org/10.1097/00011363-200020030-00005
Ehri, L. C. (2014). Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning. *Scientific Studies of Reading*, *18*, 5–21. http://dx.doi.org/10.1080/10888438.2013.819356
Ehri, L. C., & Roberts, T. A. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In S. Neuman, & D. Dickinson (Eds.), *Handbook of early literacy research* (Vol. II) (pp. 113–131). New York, NY: Guilford Press.
Ehri, L. C., Deffner, N., & Wilce, L. (1984). Pictorial mnemonics for phonics. *Journal of Educational Psychology*, *76*, 880–893. http://dx.doi.org/10.1037/0022-0663.76.5.880
Foulin, J. N. (2005). Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*, *18*, 129–155. http://dx.doi.org/10.1007/s11145-004-5892-2
Fox, C. (1993). *At the very edge of the forest; The influence of literature on storytelling by children*. London: Cassell.
Gardner, D. G., Cummings, L. L., Dunham, R. B., & Pierce, J. L. (1998). Single-item versus multiple-item measurement scales: An empirical comparison. *Educational and Psychological Measurement*, *58*, 898–915.
Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology*, *93*, 3–13. http://dx.doi.org/10.1037/0022-0663.93.1.3
Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M. Kamil, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3) (pp. 503–524). Mahwah, NJ: Erlbaum.
Harris, R. C., Robinson, J. B., Chang, F., & Burns, B. M. (2007). Characterizing preschool children's attention regulation in parent–child interactions: The roles of effortful control and motivation. *Journal of Applied Developmental Psychology*, *28*, 25–39. http://dx.doi.org/10.1016/j.appdev.2006.10.006
Hidi, S. (2001). Interest, reading, and learning: theoretical and practical considerations. *Educational Psychology Review*, *13*, 191–209. http://dx.doi.org/10.1023/A:1016667621114

Howse, R. B., Lange, G., Farran, D. C., & Boyles, C. D. (2003). Motivation and self-regulation as predictors of achievement in economically disadvantaged young children. *The Journal of Experimental Education*, *71*, 151–174. http://dx.doi.org/10.1080/00220970309602061

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development*, *73*, 509–527. http://dx.doi.org/10.1111/1467-8624.00421

Joh, A. S., Jaswal, V. K., & Keen, R. (2011). Imagining a way out of the gravity bias: Preschoolers can visualize the solution to a spatial problem. *Child Development*, *82*, 744–750. http://dx.doi.org/10.1111/j.1467-8624.2011.01584.x

Justice, L. M., Pence, K., Bowles, R. B., & Wiggins, A. (2006). An investigation of four hypotheses concerning the order by which 4-year-old children learn the alphabet letters. *Early Childhood Research Quarterly*, *21*, 374–389. http://dx.doi.org/10.1016/j.ecresq.2006.07.01

Kaderavek, J. N., Guo, Y., & Justice, L. M. (2014). Validity of the children's orientation to book reading rating scale. *Journal of Research in Reading*, *37*, 159–178. http://dx.doi.org/10.1111/j.1467-9817.2012.01528.x

LePage, P., & Mills, J. (1990). The effect of a picture symbol prereading program on preschool children's attitudes toward reading. *Child Study Journal*, *20*, 55–65.

Lepola, J. (2004). The role of gender and reading competence in the development of motivational orientations from kindergarten to grade 1. *Early Education and Development*, *15*, 215–240. http://dx.doi.org/10.1207/s15566935eed1502_5

Lepola, J., Lynch, J., Kiuru, N., Laakkonen, E., & Niemi, P. (2016). Early oral language comprehension, task orientation, and foundational reading skills as predictors of grade 3 reading comprehension. *Reading Research Quarterly*, *51*, 373–390. http://dx.doi.org/10.1002/rrq.145

Lepola, J., Poskiparta, E., Laakkonen, E., & Niemi, P. (2005). Development of and relationship between phonological and motivational processes and naming speed in predicating word recognition in grade 1. *Scientific Studies of Reading*, *9*, 367–399. http://dx.doi.org/10.1207/s1532799xssr0904_3

Levin, I., & Tolchinsky-Landsmann, L. (1989). Becoming literate: Referential and phonetic strategies in early reading and writing. *International Journal of Behavioral Development*, *12*, 369–384. http://dx.doi.org/10.1177/016502548901200306

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent-variable longitudinal study. *Developmental Psychology*, *36*, 596–613. http://dx.doi.org/10.1037/0012-1649.36.5.596

Manson, J., & Wendon, M. (2003). *Letterland early years handbook*. Cambridge, UK: Letterland Ltd.

Marsh, H. W., Craven, R. G., & Debus, R. (1991). Self-concepts of young children 5–8 years of age: Measurement and multidimensional structure. *Journal of Educational Psychology*, *83*, 377–392. http://dx.doi.org/10.1037/0022-0663.83.3.377

Mayer, R. E., Griffith, E., Jurkowitz, I. T., & Rothman, D. (2008). Increased interestingness of extraneous details in a multimedia science presentation leads to decreased learning. *Journal of Experimental Psychology: Applied*, *14*, 329.

McBride-Chang, C. (1999). The ABCs of the ABCs: the development of letter-name and letter-sound knowledge. *Merrill-Palmer Quarterly*, *45*, 285–308.

Moats, L. C. (2000). *Whole language lives on: The illusion of balanced reading instruction*. Darby, PA: DIANE Publishing.

Molfese, V. J., Beswick, J. L., Jacobi-Vessels, J., Armstrong, N. E., Culver, B. L., White, J. M., et al. (2011). Evidence of alphabetic knowledge in writing: Connection to letter and word identification skills in preschool and kindergarten. *Reading and Writing*, *24*, 133–150. http://dx.doi.org/10.1007/s11145-010-9265-8

Molfese, V. J., Beswick, J., Molnar, A., & Jacobi-Vessels, J. (2006). Alphabetic skills in preschool: A preliminary study of letter naming and letter writing. *Developmental Neuropsychology*, *29*, 5–19. http://dx.doi.org/10.1207/s15326942dn2901_2

Morgan, P. L., & Fuchs, D. (2007). Is there a bidirectional relationship between children's reading skills and reading motivation? *Exceptional Children*, *73*, 165–183. http://dx.doi.org/10.1177/001440290707300203

National Early Literacy Panel. (2008). *Developing early literacy*. Washington, DC: National Institute for Literacy.

Nelson, E. (1986). *Event knowledge: structure and function in development*. Hillsdale, NJ: Erlbaum.

Nelson, G., Westhues, A., & MacLeod, J. (2003). A meta-analysis of longitudinal research on preschool prevention programs for children. *Prevention and Treatment*, *6*, 1–34. http://dx.doi.org/10.1037/1522-3736.6.1.631a

Nilsen, E., & Bourassa, D. (2008). Word-learning performance in beginning readers. *Canadian Journal of Experimental Psychology*, *62*, 110–116. http://dx.doi.org/10.1037/1196-1961.62.2.110

O'Leary, P. M., Cockburn, M. K., Powell, D. R., & Diamond, K. E. (2010). Head Start teachers' views of phonological awareness and vocabulary knowledge instruction. *Early Childhood Education Journal*, *38*, 187–195. http://dx.doi.org/10.1007/s10643-010-0394-0

Paris, S. G. (2005). Reinterpreting the development of reading skills. *Reading Research Quarterly*, *40*, 184–202. http://dx.doi.org/10.1598/RRQ.40.2.3

Patrick, H., Mantzicopoulos, P., & Samarapungavan, A. (2009). Motivation for learning science In kindergarten: Is there a gender gap and does integrated inquiry and literacy instruction make a difference? *Journal of Research in Science Teaching*, *46*, 166–191. http://dx.doi.org/10.1002/tea.20276

Perfetti, C. A., Beck, I., Bell, L. C., & Hughes, C. (1987). Phonemic knowledge and learning to read are reciprocal: A longitudinal study of first grade children. *Merrill-Palmer Quarterly (1982)*, 283–319.

Peterson, R. A. (1994). A meta-analysis of Cronbach's coefficient alpha. *Journal of Consumer Research*, *21*, 381–391. http://dx.doi.org/10.1086/209405

Piasta, S. B., & Wagner, R. K. (2010). Developing early literacy skills: A meta-analysis of alphabet learning and instruction. *Reading Research Quarterly*, *45*, 8–38. http://dx.doi.org/10.1598/RRQ.45.1.2

Poskiparta, E., Niemi, P., Lepola, J., Ahtola, A., & Laine, P. (2003). Motivational-emotional vulnerability and difficulties in learning to read and spell. *British Journal of Educational Psychology*, *73*, 187–206. http://dx.doi.org/10.1348/00070990360626930

Preacher, K. J., & MacCallum, R. C. (2002). Exploratory factor analysis in behavior genetics research: Factor recovery with small sample sizes. *Behavior Genetics*, *32*, 153–161. http://dx.doi.org/10.1023/A:1015210025234

Preschool Curriculum Evaluation Research (PCER) Consortium. (2008). *Effects of preschool curriculum programs on school readiness (NCER 2008–2009)*. Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Washington, DC: U.S. Government Printing Office.

Puranik, C. S., Lonigan, C. J., & Kim, Y.-S. (2011). Contribution of emergent literacy skills to name writing, letter writing, and spelling in preschool children. *Early Childhood Research Quarterly*, *26*, 465–474. http://dx.doi.org/10.1016/j.ecresq.2011.03.002

Renninger, A., & Hidi, S. (2011). Revisiting the conceptualization, measurement, and generation of interest. *Educational Psychologist*, *46*, 168–184. http://dx.doi.org/10.1080/00461520.2011.587723

Renninger, K. A., Hidi, S., & Knapp, A. (Eds.). (1992). *The role of interest in learning and development*. Hillsdale, NJ: Erlbaum.

Renninger, K. A., Ewen, L., & Lasher, A. K. (2002). Individual interest as context in expository text and mathematical word problems. *Learning and Instruction*, *12*, 467–491. http://dx.doi.org/10.1016/S0959-4752(01)00012-3

Reynolds, A., & Paivio, A. (1968). Cognitive and emotional determinants of speech. *Canadian Journal of Psychology*, *22*, 255–287. http://dx.doi.org/10.1037/h0082757

Roberts, T. A. (2017). *Literacy success for emergent bilinguals: Getting it right in the prek-2 classroom*. New York: Teachers College Press.

Roberts, T. A., Vadasy, P. F., Sanders, L. A. (in press). Preschoolers' alphabet learning: Letter name and sound instruction, cognitive processes, and English proficiency. *Early Childhood Research Quarterly*.

Robertson, C., & Salter, W. (1997). *The phonological awareness test*. East Moline, IL: LinguiSystems.

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, *27*, 151–161.

Sadoski, M. (2005). A dual coding view of vocabulary learning. *Reading and Writing Quarterly*, *21*, 221–238. http://dx.doi.org/10.1080/10573560590949359

Sadoski, M., & Paivio, A. (2001). *Imagery and text: A dual coding theory of reading and writing*. Mahwah, NJ: Erlbaum.

Scarborough, H. S. (1990). Very early language deficits in dyslexic children. *Child Development*, *61*, 1728–1743. http://dx.doi.org/10.2307/1130834

Schatschneider, C., Fletcher, J. M., Francis, D. J., Carlson, C. D., & Foorman, B. R. (2004). Kindergarten prediction of reading skills. *Journal of Educational Psychology*, *96*, 265–282.

Schiefele, U. (2009). Situational and individual interest. In K. R. Wentzel, & A. Wigfield (Eds.), *Handbook of motivation in school* (pp. 197–223). New York: Taylor Francis.

Shmidman, A., & Ehri, L. (2010). Embedded picture mnemonics to learn letters. *Scientific Studies of Reading*, *14*, 159–182. http://dx.doi.org/10.1080/10888430903117492

Sijtsma, K. (2009). On the use, the misuse, and the very limited usefulness of Cronbach's alpha. *Psychometrika*, *74*, 107–120. http://dx.doi.org/10.1007/s11336-008-9101-0

Smiley, P. A., & Dweck, C. S. (1994). Individual differences in achievement goals among young children. *Child Development*, *65*, 1723–1743. http://dx.doi.org/10.2307/1131290

Snow, C. E., Burns, S., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy of Sciences.

Stipek, D. J., Daniels, D., Galuzzo, D., & Milburn, S. (1992). Characterizing early childhood education programs for poor and middle-class children. *Early Childhood Research Quarterly*, *7*, 1–19. http://dx.doi.org/10.2307/1131201

Stipek, D. J., Feiler, R., Byler, P., Ryan, R., Milburn, S., & Salmon, J. M. (1998). Good beginnings: What difference does the program make in preparing young children for school? *Journal of Applied Developmental Psychology*, *19*, 41–66. http://dx.doi.org/10.1016/S0193-3973(99)80027-6

Stipek, D. J., Feiler, R., Daniels, D., & Milburn, S. (1995). Effects of different instructional approaches on young children's achievement and motivation. *Child Development*, *66*, 209–233. http://dx.doi.org/10.2307/1131201

Stipek, D. J., & McIver, D. (1989). Developmental change in children's assessment of intellectual competence. *Child Development*, *60*, 521–538. http://dx.doi.org/10.2307/1130719

Stipek, D. J., Recchia, S., McClintic, S., & Lewis, M. (1992). Self-evaluation in young children. *Monographs of the Society for Research in Child Development*, *57*, 1–95. http://dx.doi.org/10.2307/1166190

Stipek, D. J., Roberts, T. A., & Sanborn, M. E. (1984). Pre-school age children's performance expectations for themselves and another child as a function of the incentive value of success and the salience of past performance. *Child Development*, *55*, 1983–1989. http://dx.doi.org/10.2307/1129773

Stipek, D. J., & Ryan, R. H. (1997). Economically disadvantaged preschoolers: Ready to learn but further to go. *Developmental Psychology*, *33*, 711–723. http://dx.doi.org/10.1037/0012-1649.33.4.711

Sweet, A. P., Guthrie, J. T., & Ng, M. M. (1998). Teacher perceptions and student reading motivation. *Journal of Educational Psychology*, *90*, 210–223. http://dx.doi.org/10.1037/0022-0663.90.2.210

Szekeres, C. (1983). *Cyndy szekeres' ABC*. Racine, Wisconsin: Golden Books Publishing, Inc.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (3rd ed.). New York: Harper & Row.

Taboada, A., Tonks, S. M., Wigfield, A., & Guthrie, J. T. (2009). Effects of motivational and cognitive variables on reading comprehension. *Reading and Writing*, *22*, 85–106. http://dx.doi.org/10.1007/s11145-008-9133-y

Teale, W. H., Hoffman, J. L., & Paciga, K. A. (2010). Where is NELP leading preschool literacy instruction? Potential positives and pitfalls. *Educational Researcher*, *39*, 311–315. http://dx.doi.org/10.3102/0013189X10369830

Treiman, R., Tincoff, R., Rodriguez, K., Mouzaki, A., & Francis, D. (1998). The foundations of literacy: Learning the sounds of letters. *Child Development*, *69*, 1524–1540. http://dx.doi.org/10.1111/j.1467-8624.1998. tb06175.x

Turner, J. C. (1995). The influence of classroom contexts on young children's motivation for literacy. *Reading Research Quarterly*, *30*, 410–441. http://dx.doi.org/10.2307/747624

Valeski, T. N., & Stipek, D. J. (2001). Young children's feelings about school. *Child Development*, *72*, 1198–1213. http://dx.doi.org/10.1111/1467-8624.00342

Van Breukelen, G. J. (2006). ANCOVA versus change from baseline had more power in randomized studies and more bias in nonrandomized studies. *Journal of Clinical Epidemiology*, *59*(9), 920–925. http://dx.doi.org/10.1016/j.jclinepi.2006.02.007

Wagner, R. K., & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, *101*, 192–212. http://dx.doi.org/10.1037/0033-2909.101.2.192

Warmington, M., & Hulme, C. (2012). Phoneme awareness, visual-verbal paired-associate learning, and rapid automatized naming as predictors of individual differences in reading ability. *Scientific Studies of Reading*, *16*, 45–62. http://dx.doi.org/10.1080/10888438.2010.534832

Webb, M. L., Schwanenflugel, P. J., & Kim, S. (2004). A construct validation study of phonological awareness for children entering prekindergarten. *Journal of Psychoeducational Assessment*, *22*, 304–319. http://dx.doi.org/10.1177/073428290402200402

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: a theoretical analysis. *Developmental Review*, *12*, 265–310. http://dx.doi.org/10.1016/0273-2297(92)90011-P

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*, 68–81. http://dx.doi.org/10.1006/ceps.1999.1015

Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth of their reading. *Journal of Educational Psychology*, *89*, 420–432. http://dx.doi.org/10.1037/0022-0663.89.3.420

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A. J. A., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology*, *89*, 451–469. http://dx.doi.org/10.1037/0022-0663.89.3.451

Wigfield, A., Eccles, J. S., Roesser, R., & Schiefele, U. (2008). Development of achievement motivation. In W. Damon, & R. Lerner (Eds.), *Child and adolescent development: an advanced course* (pp. 406–434). NY: Wiley & Sons.

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review*, *6*, 49–78. http://dx.doi.org/10.1007/BF02209024

Wilson, K. M., & Trainin, G. (2007). First-grade students' motivation and achievement for reading, writing, and spelling. *Reading Psychology*, *28*, 257–282. http://dx.doi.org/10.1080/02702710601186464