Reading Horizons: A Journal of Literacy and Language Arts

Volume 62 | Issue 1 Article 4

4-2023

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Susan J. Chambrè
Marist College, susan.chambre@marist.edu

READING HORIZONS

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Susan J. Chambrè, *Marist College*

Abstract

Vocabulary development remains an active and robust research area, yet little is known about what students, particularly young students, think during vocabulary learning. A commonly held assumption is that young learners employ few, if any, cognitive and metacognitive strategies when engaged in literacy tasks. Conversely, decades of research confirms that older learners with active metacognitive tools are better equipped to make meaning from text, of which vocabulary is a crucial component. To better understand the strategies and metacognitive actions young students make when learning vocabulary, student comments (N = 35) spontaneously produced during two experimental vocabulary learning tasks were reviewed and analyzed. Employing grounded theory and abductive analysis, comments reveal that young learners use several tools and metacognitive processes to support vocabulary learning. Findings suggest that children as young as 6 years old can verbalize their strategy usage and metacognitive awareness. Findings are examined in light of traditional views of young learners' metacognitive development and connectionist reading models of grapho-phonemic connections as facilitators of vocabulary learning. Implications for research on the role of metacognition during vocabulary learning with early learners and orthographic exposure during vocabulary learning are discussed.

Keywords: ***vocabulary, metacognition, orthography, early learners, literacy***

Vocabulary learning is a critical component of effective literacy attainment as it significantly impacts proficiency with reading comprehension (National Institute of Child Health and Human Development, 2000; Snow et al., 1998; Wright & Cervetti, 2016). Inquiry about vocabulary development remains robust, as evidenced by over two million One Search entries of academic papers, books, or periodicals for the term *vocabulary development*. Vocabulary learning is multifaceted, as scholars examine topics such as content area vocabulary (Fisher & Frey, 2014; Nagy & Townsend, 2012), vocabulary acquisition for English as a new language (ENL) students (August et al., 2020; Carlo et al., 2004),

vocabulary strategies for students with disabilities (Bryant et al., 2003; Kuder, 2017; McGregor et al., 2021), and vocabulary development for emergent readers (Hadley et al., 2016; Harris et al., 2011).

Teachers in preK–12 settings have several instructional options for teaching vocabulary. Graves's (2016) four-pronged approach consists of (a) providing rich and frequent language experiences, (b) teaching individual words, (c) teaching word learning strategies, and (d) fostering word consciousness. The tier model of word classification suggests providing cyclical and targeted instruction of Tier II or high-utility words (Beck et al., 2002, 2008). A third but less effective technique is using prepackaged curricular programs with workbooks or decontextualized word lists from literacy programs (Hiebert, 2019). Additionally, teachers depend on textbooks or teacher-facing professional development books for suggestions of vocabulary teaching practices (see, e.g., Cobb & Blachowicz, 2014; Diamond & Gutlohn, 2006; N. Schmidt & Schmidt, 2020).

Knowledge about vocabulary instruction is extensive, but little is known about how students process while learning vocabulary. Even less is known about which supports and strategies students, particularly young learners, utilize to facilitate vocabulary learning. Questions also remain about student intentionality or consciousness when learning vocabulary. Do children understand that they can activate specific learning tools to support vocabulary learning? Vocabulary research is conducted on participants, not with them, leaving student voices silent. Understanding participant knowledge via qualitative inquiry provides shifting perspectives about observed phenomena (Daher et al., 2017). Without conversations with study participants, the field underutilizes findings from metacognitive and metalinguistic constructs to test new and innovative methods of vocabulary acquisition.

After a thorough review of existing vocabulary learning literature, little research was identified that examines children's cognitive and metacognitive processing during vocabulary instruction. To address this gap, spontaneous participant comments were intentionally collected during two quantitative vocabulary experiments of 100 first-grade students from four public elementary schools. Quantitative results from both studies showed positive effects of orthographic exposure on vocabulary acquisition of early learners (Chambrè et al., 2017, 2020). A total of 35 of the 100 participants across both studies produced spontaneous comments, with the remaining 65 students making no comments. Collecting unprompted comments was intentional, as stream-of-consciousness thinking uncovers participant thinking in the moment, without bias or halo effects reported during structured recall protocols. Analyzing student thinking may shed light on specific strategy or tool usage during vocabulary learning, moving the vocabulary research field forward in new directions.

Theoretical Frameworks

This study employed an interdisciplinary approach drawing from various domains of psychological and educational research. To understand how students learn to create connections between word reading and vocabulary learning, methods and analyses are based on the theory of sight word learning (Ehri, 2014) and the lexical quality hypothesis (Perfetti, 2007; Perfetti & Hart, 2002). To understand student thinking about vocabulary learning, theories of metacognition proposed by Baker and Brown (1984), Flavell (1979),

and Myers and Paris (1978) are reviewed.

Connectionist Theories

Connectionist theories of word learning posit that orthography (operationally defined as word spellings) serve as a mnemonic that binds pronunciation and spelling (Ehri, 1998, 2005, 2014; Perfetti & Hart, 2002). According to Ehri's (1980, 1992, 1998, 2005, 2014) theory of sight word learning, learners create phonological and semantic representations of words that are subsequently mapped to memory. Orthography, pronunciation, meaning, and syntax work in tandem, enabling mapping of pronunciations to visual representations of words (Ehri, 1992, 2005). This connection partially explains the link between vocabulary knowledge and literacy skills since pronunciation and spelling are difficult skills for early readers (Burt & Fury, 2000).

According to the lexical quality hypothesis (Perfetti, 2007; Perfetti & Hart, 2002), word knowledge develops along a low to high continuum based on characteristics such as form and meaning. Words with high lexical quality are quickly retrieved from memory because of concrete sound–spelling connections as well as concrete meanings that easily transfer across multiple contexts. Words with low lexical quality contain sound–spelling irregularities and lack flexibility of meaning, occurring in usually only one context. As students repeatedly encounter words via reading, hearing, and speaking, they create stronger lexical representations and are more likely to move words to memory. The lexical quality hypothesis advantages better readers who have stronger orthographic mapping skills, thus creating automatic connections as a result of repeated practice and exposure (Perfetti & Hart, 2002).

Connectionist reading theories also apply to vocabulary learning. Research demonstrates that learning novel vocabulary in conjunction with orthographic exposure enhances vocabulary learning, in a process called *orthographic facilitation*. When participants learn new vocabulary words with spelling present, orthography and pronunciation activate learning to support recall of word meanings (Lucas & Norbury, 2013; Mengoni et al., 2013; Ricketts et al., 2009; Rosenthal & Ehri, 2008, 2011; Vadasy & Sanders, 2015, 2016). More critically, research indicates that vocabulary learning with accompanying print outperforms vocabulary learning without print exposure (Ehri, 2014; Ehri & Rosenthal, 2007; Ricketts et al., 2009; Rosenthal & Ehri, 2008, 2011). These findings have been replicated with typically developing children as well as those from special learning populations.

Metacognition

Metacognition, a branch of cognitive science, emerged in the mid-1970s via inquiry by seminal researchers Baker and Brown (1984), Flavell (1979), and Paris (Myers & Paris, 1978). Defined as a learner's ability to "control their own learning, consciously define learning goals, and monitor their progress in achieving them" (Donovan & Bransford, 2005, p. 10), metacognition explores how awareness supports one's ability to monitor and self-assess thinking. Cross and Paris (1988) defined metacognition as knowledge of one's cognition or thinking process via tools labeled self-management and self-awareness.

Metacognition allows learners to assess their understanding and determine whether new concepts fit into existing schemas.

According to Flavell (1979), readers need both metacognitive knowledge and metacognitive awareness to successful engage in tasks. Metacognitive knowledge and awareness result from interactions between person, task, and strategy. For example, a *person* decides to complete a *task* and selects specific *strategies* with which to complete it. Metacognition also encompasses metacognitive experiences and coordination, the ability to monitor actions through metacognitive knowledge (Myers & Paris, 1978). Metacognitive experiences allow students to revise their thinking, change existing cognitive structures, and activate metacognition to complete a task. Students can also activate cognitive monitoring to determine the skills needed to complete a task.

Review of Research on Metacognitive Reading Processes

Extensive research on metacognitive processing during reading provides answers about how learners comprehend text. Less is known about interactions between metacognition and vocabulary learning, particularly for young readers. Constructing meaning from text is intrinsically tied to vocabulary knowledge as understanding text necessitates understanding novel word meanings.

Metacognition and Reading

Based on constructivist theories (Vygotsky, 1977), students create meaning from text by using tools or strategies such as rereading or questioning. Developing metacognitive awareness facilitates active participation via self-monitoring as learners handpick specific metacognitive skills and tools to support text comprehension (Paris & Lindauer, 1982). Bransford and Schwartz (1999) and Donovan and Bransford (2005) suggested that metacognitive awareness is intrinsically linked to student questioning as questions reflect a need to challenge understanding. Questioning also helps students determine whether a literacy tool sufficiently aids text comprehension. Finally, metacognitive self-regulation is activated in a dynamic process of checking and monitoring for understanding while engaged in a task (Schmitt, 1988, 2003, 2011). Baker and Brown's (1984) seminal work views metacognition, metacognitive awareness, and metacognitive self-regulation as overlapping processes that support one another. Students engage in a cyclical process of activating one or more metacognitive components based on ability, skill, or text type. Once automatic, students' literacy skills continue to grow and adapt until they reach full reading proficiency.

Metacognition and Young Readers

Researchers initially theorized that young readers lack metacognitive thinking because of underdeveloped self-regulatory and self-monitoring skills, an inability to grasp reading purpose, and an overemphasis on word reading strategies, not meaning making (Baker & Brown, 1984; Flavell, 1979; Myers & Paris, 1978; Paris et al., 1991). They also noted that students learn how to activate metacognitive processes beginning in the intermediate grades (Baker & Brown, 1984). Yet earlier claims about underdeveloped metacognition appear unfounded as changes to research methodologies and research designs now

provide new insights into young students' metacognitive awareness (de Bruin & van Gog, 2012; Kragler et al., 2015).

Emerging metacognition is now captured via self-reporting scales or indexes of metacognitive knowledge (Eilers & Pinkley, 2006; Lee & Schmitt, 2014; M. C. Schmitt, 2006). Researchers also conduct observations in natural learning environments to notice how metacognitive skills change over time and how language interactions support metacognitive skill development (Clay, 1993; Cobb, 2014; Kragler et al., 2015; Martin & Kragler, 2011; Pratt 2020). In addition to observations, student interviews uncover how young students metacognitively engage with print (Pratt, 2020; Pratt & Martin, 2017a, 2017b). Interview analysis and think-aloud protocols reveal that early readers focus on word-level strategies such as decoding errors but experience difficulty with self-monitoring for meaning (Kragler & Martin, 2009; Kragler et al., 2015). Interviews with kindergarten and first graders indicate that students can name strategies but default to decoding tools to repair reading (Martin & Kragler, 2011). Interestingly, text type and student age may mediate metacognitive strategy and self-monitoring usage as nonfiction reading results in more self-correcting and recorded student comments (Martin & Kragler, 2012).

Student comments also play an integral part during assessment of metacognitive growth. Research from Reading Recovery (RR) interventions (Clay, 1993) reports that RR student comments reveal metacognitive knowledge and awareness, particularly following sessions and during simulated recall (Cox, 1994; Cox et al., 1998; Juliebö et al., 1998). Research also uncovers how first graders self-monitor and self-correct during independent reading (Lee & Schmitt, 2014; Pratt & Martin, 2017a), with more proficient readers articulating self-monitoring and self-regulating strategies when compared to less proficient readers (Pratt, 2020). RR student comment analyses also reveals accelerated metacognitive knowledge usage, metacognitive task production, and strategy usage (M. C. Schmitt, 1988, 2001, 2003, 2011). Further, third- and fourth-grade RR graduates' longitudinal data from self-reports on the Metacomprehension Strategy Index reveal lasting changes to metacognitive strategy usage (M. C. Schmitt, 2003).

Orthography Facilitation. Recall protocols, observations, and interviews provide a broader picture of young children's metacognition abilities. Yet less is known about how young readers activate metacognition when engaging with print. Qualitative research indicates that children understand how print supports learning, as noted by two first graders' comments: "I just try to figure if I have seen the word before" and "because once you look at the word, you can actually say them inside your head and it make sense" (Pratt & Martin, 2017a, p. 465). Coding schemas of student interviews and observations frequently include print-focused codes such as *look at words*, *focus on words, word cues*, *letter cues*, and *word parts* (Juliebö et al., 1998; Martin & Kragler, 2011, 2012; Pratt, 2020), while interview comments include terms like *word spellings, sounding out words,* and *recognizing that good readers attend to words* (Kragler & Martin, 2009). Results suggest that young students think about orthographic facilitation, but do they understand that print is activating learning? This question remains unanswered.

Metacognition and vocabulary learning.

To better understanding the connection between vocabulary and metacognition, vocabulary learning should be viewed as a metalinguistic skill nested within a metacog-

nition framework (Cox, 1994; Nagy & Scott, 2000). Nagy and Scott (2000) argued that metalinguistic knowledge supports language development. Metalinguistic awareness and flexibility also enable learners to understand abstract concepts such as word awareness, word formation, and how words confer meaning. Additionally, metalinguistic skills assist learners with applying word knowledge in context.

Yet vocabulary research remains focused on word meaning. Recent vocabulary meta-analyses described vocabulary learning outcomes rather than student comments or vocabulary thinking. Findings from Flack and colleagues (2018) indicate vocabulary acquisition is best supported by dialogic reading interactions and increased exposures to new words. Wright and Cervetti (2016) discussed the need for students to develop flexibility with vocabulary word retrieval. Yet both studies neglected the role of metacognition.

An extensive literature review on academic search engines with keywords *vocabulary and metacognition*, *student meta/cognition during vocabulary*, and *metacognition and vocabulary learning* identify only four intervention studies addressing student metacognition via self-monitoring and self-regulating (Harmon et al., 2010; Lubliner & Smetana, 2005; Biemiller, 2010; Uccelli & Paez, 2007). These studies examined student thinking and student comments during vocabulary learning, not just as a result of memorizing definitions.

The first study, by Lubliner and Smetana (2005), noted a lack of research examining this connection. They argued that vocabulary learning should include a metacognitive lens and emphasize the role of self-monitoring and self-regulation. They trained fifth-grade teachers in an instructional program that teaches strategies for self-monitoring vocabulary comprehension and self-regulating vocabulary learning. Researcher-created assessments revealed that the program supports flexibility with metacognitive strategies and increases reading comprehension and vocabulary learning scores.

Harmon and colleagues (2010) developed the cognitive vocabulary strategies approach (CVA) to increase high schoolers' metacognitive and word consciousness skills. Students learn three strategies: identifying unknown words, learning word meanings, and relating word meanings. Unlike traditional vocabulary instruction, CVA teaches students to understand the purpose of learning new words by asking questions such as "Why is this word important?" or "How is this word being applied in this context?" CVA's integration of metacognitive awareness increased students' abilities to pause and self-question while determining new word meanings.

In a study of first-grade bilingual children's vocabulary development, children's word choices and response length were reviewed to uncover developmental patterns of oral language (Uccelli & Paez, 2007). However, dictated story transcripts failed to fully capture which self-regulatory tools students engaged with to learn vocabulary. Finally, exploratory data collected from a self-monitor vocabulary intervention with sixth-grade ENL students saw positive results (Biemiller, 2010). Students learned how to seek support from a teacher or ask questions of one another. Outcomes indicate increased student self-monitoring for word meanings and enhanced abilities with oral definitions; however, follow-up research was not conducted.

Despite these studies, there remains little knowledge about how learners activate metacognitive skills during vocabulary learning. Further, with the exception of Uccelli and Paez (2007), research is conducted with older students and conversation with participants does not occur. Rather, students are taught techniques and learning outcomes are measured. To better understand how cognitive processing of vocabulary occurs, research that includes student voice is still needed.

Research Questions

Studies confirm that print exposure facilitates vocabulary acquisition, but experiments fail to uncover what causes learning effects. Do students consciously draw on print to learn new words? Are they aware that print supports vocabulary learning? Are there other tools that activate vocabulary learning? To explore how students engage with new vocabulary on cognitive and metacognitive levels, we recorded student comments for qualitative analysis. Spontaneous talk revealed insights into student thinking and engagement not apparent during oral reading (Moschovaki & Meadows, 2005). The following research questions guided this study:

1. What can be learned from students' spontaneous comments during vocabulary learning tasks?

2. What cognitive or metacognitive processes are revealed by students' spontaneous comments when learning novel words?

Methods

Data analyzed for this study were obtained from two quantitative experimental research studies conducted with first-grade students in four public elementary schools in the northeastern United States. Study 1 and Study 2 used similar research designs, methods, and materials but examined effects based on different experimental conditions (see Chambrè et al., 2017, 2020). The two studies also differed by examining the effects of orthographic facilitation on students from communities of varying socioeconomic status (SES), not only convenience sampling from upper-SES homes.

Setting and Participants

Study 1 was conducted in a high-SES suburban K–5 public elementary school. The participants were 45 English-proficient students (24 girls and 21 boys). Students ranged in age from 6 to 7 years old (M = 6.77, SD = 3.85), with 89% identifying as White and 11% as Asian. Study 2 occurred in three Title-I urban public elementary schools located in different cities than Study 1. Participants were 55 English-proficient first graders (31 girls and 24 boys). Students ranged in age from 6 to 7 years old (M =6.79 years, SD =

Table 1

Participant Demographics

Participants			Number of Codes Present				
	M	*SD*	Orthography	Pictures	Pronunciation	Task Ease	Metacognition
Study 1 (n=19)	6.77	3.85	15	6	4	5	7
Study 2 (n=16)	6.79	0.32	14	9	7	5	7

0.32), with 76% identifying as Hispanic, 9% as White, 5% as Asian, 4% as African American, and 4% as multiethnic (see Table 1).

Literacy curriculum

Participating schools implemented two different English language arts instructional approaches. The school in Study 1 and one school in Study 2 teach reading based on balanced literacy approaches, including word study and reader's and writer's workshop. These approaches focus on teacher modeling and extensive student practice talking about text. Students have access to large classroom libraries, weekly meetings with a school librarian, and individual leveled book selection via *book shopping*, classroom time set aside each week for students to independently select books for personal reading.

Students attending Study 2 schools use a comprehensive basal reading program with six units of highly scripted lessons. The program addresses literacy areas outlined in the Common Core State Standards (2010) such as phonics and vocabulary development. Informal classroom observations were conducted while the researcher transitioned participants to and from the testing area. Observations lasted 5–10 minutes and occurred approximately three to four times daily over a 3-month period. Of note, students lacked extensive time to discuss thinking with teachers or peers, instead participating in extensive seat-time activities such as independent reading, completing teacher-created worksheets, completing workbook pages, or watching educational videos. Teachers asked surface-level questions requiring factual information about text with little extended dialogue. Schools were noted to have smaller classroom libraries, limited access to a school librarian, and little student agency regarding book selection.

Study Procedures

Students from both studies were taught 12 individual obscure CVC vocabulary words in a paired-association learning task. A repeated-measures counterbalanced design

accounted for learning effects. Students were shown two sets of picture cards of short vowel words such as *yag*, fake costume jewelry. The control condition picture card set had no print, and the experimental condition picture card set had study words printed beneath the picture. The experimental condition differed between Study 1 and Study 2. Students were taught the word and interacted with the print in one of three ways: (a) saw the picture with the word printed below but no attention was made to the spelling (Studies 1 and 2), (b) saw the picture with the word printed below and were told to point to the spelling while saying the word (Study 1), or (c) saw the picture with the word printed below and were asked to decode the word (Study 2).

Students learned one set of six words on Day 1. On Day 2 students were given a posttest for recall of spelling, meaning, and pronunciation of Day 1 words. They were then taught the second set of six words, with a change in testing condition. On Day 3 students were given a posttest for Day 2 words. One-week posttesting was conducted on all 12 study words. Detailed descriptions of study procedures can be found in Chambrè et al. (2017, 2020).

Analysis of Student Comments

Researching young learners' metacognition poses challenges such as difficulty with articulation of thinking as well as halo effects (i.e., pleasing the tester) during recall procedures (Pratt & Martin, 2017a). To address these challenges this study avoided prompting or other established protocols and relied on spontaneous comments to better understand participants' independent thinking while completing a task (Moschovaki & Meadows, 2005).

During both testing sessions, all comments made during testing were recorded. To avoid confusion or ambiguity, Study 2 student comments were audio recorded. Comments removed for analysis included unrelated comments (e.g., "Can I have a drink of water?") or those directly related to the study (e.g., "Can you repeat that?"). In Study 1, spontaneous comments were written in the protocol form margins. During Study 2 comments were audio recorded with notations made on the protocol for later transcription from the audio file. Audio recording allowed testers to focus on study procedures, not transcribing student comments. To prevent halo effects, no follow-up questions about comments were asked during or after testing sessions.

In total, only 19 of the 45 participants in Study 1 and 16 of 55 participants in Study 2 made comments unrelated to the study, totaling 35 participants. The remaining 65 participants made no spontaneous comments. In Study 1, participants uttered 23 sentences, with 21 single-sentence comments. One student made a two-sentence comment and another a four-sentence comment. Two students made more than one comment. In Study 2, 16 students made comments totaling 32 sentences. There were nine single-sentence comments, three two-sentence comments, one three-sentence comment, one four-sentence comment, and two five-sentence comments. Interpretation of comments was easily established as these young students generally produced short utterances of only a sentence or two.

Data Analysis and Coding

Following both studies' completion, student comments were transcribed and digitized for further analysis. Based on grounded theory (Glaser & Strauss, 1967), inductive coding was conducted with Study 1 words (Savin-Baden & Major, 2013). During open coding, each sentence received a brief comment description, resulting in patterns related to metacognition and linguistic ability. The data were reexamined via axial coding, resulting in five categories: orthography, picture cues, connections, pronunciation, and task ease. Comments were then recoded with the five category terms (see Table 2 for codes, definitions, and example statements).

For Study 2, abductive analysis was used based on the five Study 1 codes. Whereas grounded theory discards predetermined notions about data to allow themes to emerge, abductive analysis draws on grounded theory by using emerging and existing theories to broadly examine phenomena (Timmermans & Tavory, 2012). By viewing data through a lens of what is and is not known, abductive analysis provides a broader theoretical framework for examining observed phenomena.

Table 2

Study Codes and Definitions

Study Code	Definition	Example
Orthography	References to either orthography, word units, letters, or name of the study word	"How come there is no writing?"
Pictures	References seeing or remembering the picture, absence of picture, or use of picture to recall study word	"I wish you would show me the picture."
Pronunciation	References to a specific letter sound or pronunciation of a word or sound	"I can't remember the names but I can r
Task Ease	References the task as either begin easy or hard	"I know it starts with a /ga/."
Metacognition	References to remembering or using metacognition to complete the task	"When I saw the word, it makes the stuff in my brain."

To establish rigor and trustworthiness of the coding schema, a process of coding, systematizing, and disclosing analysis methods was utilized to establish credibility, trans-

ferability, dependability, and confirmability (Lincoln & Guba, 1985). Tests of intercoder reliability were conducted on both data sets by secondary coders. Since participants were inaccessible during qualitative analysis and because of their young age, peer debriefing over multiple rounds of coding was employed to establish credibility of data interpretation, inter-coder reliability, and agreement.

In Study 1 the second coder, a doctoral student studying metacognition with young readers, received a Microsoft Word document containing codes with definitions and student comments. The coder highlighted sections of the student comment and attached codes to text. Inter-coder reliability of 94% was achieved. In Study 2, comments were analyzed via the web-based mixed-methods analytic platform Dedoose. An undergraduate research assistant coded comments on Dedoose via the coding test feature by attaching codes to text on the computer's interface. Inter-coder reliability of 93% was achieved. After establishing inter-coder reliability, data were examined in light of the research questions and theoretical frameworks. Data findings emerged based on theoretical, method, and analytical choices, with thick descriptions exploring themes and patterns based on student comments. Of note, coding results remained stable and similar across both studies despite differing racial and SES populations.

Results

Analysis of spontaneous comments revealed that students learning new vocabulary activate multiple processes. A majority of codes reflect use of print or images during paired-association tasks and in some cases metacognitive strategies and orthographic knowledge. Findings support the notion that younger children focus primarily on print while learning (Baker & Beall, 2009). Additionally, comments uncovered emerging metacognitive skill knowledge.

Research Question 1

Research Question 1 broadly addresses what spontaneous comments reveal about thinking during vocabulary learning tasks. Findings across both studies indicate that young students used several tools such as orthography, images or pictures, and pronunciation. Participants were also cognizant of how easy or hard learning new words is.

Orthography

In Study 1 a total of 15 comments and in Study 2 a total of 14 comments referenced orthography, making it the most frequently applied code. The large percentage of references to orthography indicate bootstrapping effects of print on student vocabulary learning. *Orthography* codes appear in three forms or subgroups: orthography supporting learning, specific features of orthography, and spelling.

The first subgroup references how orthography supports learning by noticing print on the picture cards (see Table 3 for examples). This comment type occurred on the experiment's second day, the control condition, when print was absent. Comments indicate that students noticed how print supports and facilitates vocabulary learning, as seen from Study 1 participant comments: "Why doesn't it have the words on the bottom, it's harder" and "Why doesn't it say the word like last time?!"

Table 3

Orthography Subcodes

	Example Quotes
Orthography supports learning	"This is so new...and they don't have words. Last one did have words."
	"We're going to remember because it says it" (points to spelling of the word on picture card)
Specific features of orthography	"It was in a pattern" (refers to CVC)
	"Instead of y you put n" Is referring to study word hun
Spelling	"Something with an l"
	"How come there's no spelling?"

The second orthography-based subgroup focuses on specific letters in words. Student comments occurred during study trials and learning trials. Study 1 comments include "I remember it was a three-letter words and started with *r*" and "Word were on it. I knew a lot of them, they had three letters so knew." In the first comment, the student utilizes cognitive processing by noticing orthographic patterns, a three-letter word or CVC, and initial letter *r*. The second comment references orthography by mentioning three letters.

Study 2 students also used print as a tool: "I know it's an *e* but I can't remember its sounds?" and "Instead of *y* you put *n.*" In these cases, students note orthographic features even though they cannot recall the entire word. Viewing letters as a mnemonic tool that bind sounds to symbols indicates knowledge of the alphabetic principle, a crucial skill necessary for proficient reading (Ehri, 2014; National Institute of Child Health and Human Development, 2000).

The final orthography comment subtype is word spellings. In Study 1 two students remarked about the absence of spelling during learning trials. In Study 1, one student on two occasions stated, "How come it doesn't have the word?" continuing with "How come it doesn't have the word? So people can remember it better." Another student noted that while they could not recall word meaning, they "know how to spell it." In Study 2 one student noted, "How come there's no spelling?" These comments suggest that in some cases an absence of print deprives students of an important analytic component and mnemonic tool.

Pictures

In Study 1 six comments and in Study 2 nine comment referenced pictures. *Pictures*, the second most common code, includes three distinct subcategories: seeing or remembering the picture, absence of the picture, and using pictures to remember the

word (see Table 4). The first category references when students use pictures to recall the word's meaning. The second category reveals understanding and metacognitive thinking about needing a picture to learn. The final category includes metacognitive thinking about pictures as a learning tool.

Table 4

Pictures Subcode

	Example Quotes
Picture to recall the meaning of the word	"Can I look at the picture for once?"
	"I wish you would show me the picture."
Metacognitive thinking about how pictures support recall	"Actually, I look at the pictures and look at my head."
	I'm going to try and think of the picture in my head.
	"You tell the picture word. I try to get the word again."
Picture as a tool for learning	"I got it in my head...I got the picture in my head".
	"Picture helped me with the words."

In the first subcategory, students made requests to see the picture during recall of meaning or pronunciation. Participant statements centered on viewing the picture on the word cards. Study 1 comment included "Can I see the picture?" and "I wish you would show me the picture," similar to Study 2 comments of "Can I look at the picture for once?" and "I want to, to look at the picture."

The second subcategory, picture as a tool, indicates participant thinking about how pictures facilitate learning. These comments demonstrate awareness of pictures as enhancing recall for meaning or pronunciation and that pictures are tools that connect images to learning (Vygotsky, 1977). Examples from Study 1 include "Pictures helped me with the words" and "I can't remember the names but I can remember the picture" and from Study 2 included "Actually, I look at the pictures and look at my head. I rephrase what you said. I put the names in my head and saying them and saying them."

The final picture subcategory, emergent metacognition, demonstrates that students can describe specific self-monitoring strategies that support recall for word meaning. When recalling meaning, a Study 1 participant responded, "I'm going to try and think of the picture in my head." In Study 2 a student commented, "And then I try to do like hold it there and then until the word and picture get to, I just say it." These insights suggest developing student awareness of pictures as tools and of how activating the strategy supports learning.

Pronunciation

In Study 1 four comments and in Study 2 seven comment referenced pronunciation (see Table 5). The third code to emerge, *pronunciation* references a specific letter sound or pronunciation. The first subcategory references a specific sound or a general

Table 5

Pronunciation Subcodes

	Example Quotes
Specific letter sound	I remember the /i/.
	"Remember it starts with 'r'"
Reference to a word	"When I say the word it makes the stuff in my brain."
	"Actually I look at the pictures and look at my head. I rephrase what you said. I put the names in my head and saying them and saying them."

reference to words or word parts. The second subcategory references use of pronunciation as a learning tool.

Specific letter sound comments indicate that students attended or noticed individual sounds. During Study 1, one participant stated, "I remember the /i/" while another said, "I know it starts with a /ga/." In Study 2 one student recalled, "I remember it starts with /r/" and "I was sounding it out." These comments reveal specific connections between orthography and pronunciation. Although the students did not pronounce the entire word, partial recall of specific sounds demonstrates emerging knowledge of orthographic facilitation.

The second pronunciation subgroup references pronunciation as a learning tool. Students indicated metacognitive skill usage by explicitly stating how pronunciation enables learning, thus recognizing the "glue" that binds spelling to meaning via orthographic mapping (Ehri, 2014). For example, in Study 1 one student commented, "When I say the word it makes the stuff in my brain"; in Study 2 one student stated, "When you say the word, you tell me what the words is. I like put some random letters and try to find the letters to make...to, to spell the word," and another said, "Actually I look at the pictures and look at my head. I rephrase what you said. I put the names in my head and saying them and saying them." Students articulated specific supports and what precisely causes these supports to occur. Awareness of print-sound mapping demonstrates emerging metacognitive awareness of this valuable vocabulary learning tool.

Task ease

In Study 1 and Study 2, students generated five comments apiece about task ease. The code *task ease* references how hard or easy participants felt the task was. Comments are divided into two subgroups: a factor making the task easy and a factor making the task difficult (see Table 6). Interestingly, students perceived why the task was hard and referenced specific tools to support recall. In Study 1 comments identified print as making the task easier: "It has a name on it, makes it easier" and "It's easier because it has the names." In Study 2 a student commented about pronunciation making the task easier: "That's the easiest because, um, when you were telling me the name that was the last one so it's easier to remember." The comment may, however, indicate potential bias of recency effect in addition to connections to pronunciation.

Table 6

Task Ease Subcodes

	Example Quotes
Factors making the task easy	"That's the easiest (refers to word cur) because um when you were telling me the name that was the last one so it's easier to remember"
	"They were easy, the 1st letters vowels were easy last stound were easy to put them end."
Factors making the task difficult	"This is so new...and they don't have words. Last one did have words."
	"Why doesn't it have words on the bottom's it's harder?"

Conversely, students noticed the tool's absence, thereby making the task more difficult. In Study 1 two students noted that the task was harder because something was missing: "Why doesn't it have words on the bottoms, it's harder" and "I forgot because it doesn't say the word so people can remember it better." In Study 2, one student mentioned difficulty with the task: "This is so new…and they don't have words. Last one did have words." In all three cases, students connected the absence of print to difficulty with recall. Their comments suggest an understanding that print facilitates learning and the absence of print makes the task more difficult.

Research Question 2

The second research question unpacks what cognitive and metacognitive processes students may be using while learning new vocabulary. In Study 1 eight of the 37 distinct comments and in Study 2 seven of the 42 comments referenced metacognition (see Table 7). The metacognition code was applied when a student specifically referenced making a connection or thinking to facilitate learning. Codes are divided into two subcategories: recognizing that a specific tool facilitates learning and general comments about thinking during study tasks. Study 1 and Study 2 are examined separately.

Table 7

Metacognition Subcodes

	Example Quotes
Recognizing a tool supports learning	"When I say the word, it makes the stuff in my brain"
	"I'm trying to think of it. I know it's an 'e' but I can't remember it's sounds?
Making connections	"Lad, I remember of Aladdin."
	"And then I try to do like hold it there and then until the word and picture get to, I just say it"

Study 1

Of the eight comments generated, five reference cognitive actions that facilitate learning related to the words, sounds, or pictures. Although most students later failed to recall the entire pronunciation or complete meaning, comments provided support for emerging metacognitive usage via orthographic connections to print. As one student noted, "I remember it was a three-letter words and started with r." They verbalized two salient print features that support recall: the orthographic CVC pattern and the initial letter. Another participant commented, "I remember the /i/," demonstrating emerging understanding that orthographic is a recall tool. The connection, however, is incomplete or underdeveloped, as they only stated a sound, not the entire word.

The other three *metacognition* codes in Study 1 relate to making connections. Comments included "I'm going to try and think of the picture in my head" and "When I say the word it makes the stuff in my brain." The pictures and pronunciations are tools that engage metacognitive self-reflection and support successfully task completion. The final comment, "I knew a lot of them. They had three letters, so knew" reflects the connection orthography and CVC patterns have on creating print, pronunciation, and meaning amalgamations (Ehri, 2014). This student, at a young age, understood that a letter pattern facilitates learning.

Study 2

In Study 2 participants made seven metacognitive comments using specific features of orthography, pictures, or pronunciation. Two comments included partial visual representations: "I'm trying to think of it. I know it's an *e* but I can't remember its sounds?" and "I forgot but it's something that started with the letter *h*." In these instances, a partially created print amalgamation is indicative of emerging understanding of how print anchors learning.

Other participants clearly stated thinking and tools used to accomplish word re-

call. Two particularly insightful comments discussed the role of working memory: "Actually, I look at the pictures and look at my head. I rephrase what you said. I put the names in my head and saying them and saying them" and "And then I try to do like hold it there and then until the word and picture get to, I just say it." Data from both studies demonstrate that students actively construct learning via emerging metacognitive strategies and create connections to print or pictures.

Discussion

Qualitative analysis of 35 first graders' spontaneous comments during two vocabulary learning studies provides perspective about unexplored areas of vocabulary learning. To understand participants' independent thinking or noticing during learning, this exploratory research is framed around an intentional methodological choice of studying spontaneous comments without employing established metacognitive recall procedures. Inviting students into the conversation allows for a new way of examining their preferences for selecting tools to support learning and understanding metacognitive self-reflection on tools. Findings provide ideas for new directions in vocabulary learning research.

Study 1 and Study 2 reaffirm previous findings that identified the role that mapping word pronunciations onto spellings plays in learning novel words (Ehri, 1998, 2005, 2014; Perfetti, 2007; Perfetti & Hart, 2002). When young children use orthography during vocabulary learning, print exposure better supports recall for pronunciations, spellings, and meanings (Chambrè et al., 2017, 2020). By examining spontaneous comments during experiments, we can begin to untangle which components of orthographic facilitation support vocabulary recall.

Findings suggest that students primarily draw on orthography, pictures, and pronunciation. Comments reveal that even young students understand that specific tools enhance learning and that they have agency with picking tools. Our findings also demonstrate that some young readers are metacognitively aware about specific tools that facilitate learning, supporting previous findings on how young learners employ metacognitive strategies while reading text (Kragler et al., 2015; Lee & Schmitt, 2014; Martin & Kragler, 2011, 2012; Pratt, 2020; Pratt & Martin, 2017a, 2017b; Schmitt, 2006. These studies, however, do not specifically focus on vocabulary learning, nor do their coding schemas examine orthographic facilitation as an observed phenomenon. Our findings examine these processes and extend understandings of metacognitive strategy usage with young children in three other ways.

Whereas other research teams broadly investigated literacy skills, our research specifically examined vocabulary development within a metacognitive framework. Currently, only two identified studies have examined student metacognitive thinking during vocabulary learning (Harmon et al., 2010; Lubliner & Smetana, 2005). Results from this study support these studies' findings by demonstrating how participants actively navigate, both consciously and unconsciously, metacognitive tools to better learn new vocabulary words.

Further, previous research on metacognition and vocabulary learning occurred in upper elementary and secondary classrooms, not with students in lower elementary grades

(Harmon et al., 2010; Lubliner & Smetana, 2005). Findings from our study confirm that young children can understand, name, and use specific tools to learn vocabulary, supporting a growing body of literature about young students' rudimentary understandings of their ability to activate metacognitive tools.

Finally, this research contributes to the field by including orthographic facilitation as a specific metacognitive tool. Previous studies examined metacognitive strategies as students were beginning to learn how to read. Strategies of note include noticing decoding errors and using repair strategies, with no mention of orthographic facilitation. Our results suggest that even young learners can harness an additional metacognitive tool: the mnemonic power of orthographic facilitation.

Limitations

While research includes limitations, steps were taken to establish trustworthiness of study findings. First, to eliminate bias and possible halo effects, students were not instructed or prompted to comment during testing. From the onset, data collection was intentional but not inclusive of probing questions. Rather, comments captured spontaneous thinking from students who chose to speak, a self-selecting group. Findings are limited somewhat since we can glimpse into the thoughts of only those who commented, leaving unknown the tools employed by the other 65 first graders.

Second, as noted earlier in the literature, measuring metacognition requires active participation and knowledge by study participants. Traditional vocabulary research is done on participants, not with them, ignoring student voice during vocabulary learning. This analysis is an initial effort to capture metacognitive thought processes via spontaneous comments, not Likert scales or pretest-posttest results. Including established metacognitive procedures, such as simulated recall or participant interviews, in vocabulary research studies may amplify student voice in the research process. Questions such as "What helped you remember the new word I taught you?" and "How were you able to remember the words I taught you?" hold potential for directing researchers toward a better understanding of the specific tools or strategies participants use during vocabulary learning. Additional investigation awaits that will further our understanding of the metacognitive workings of vocabulary learning.

Implications

This study has several important implications regarding vocabulary learning and metacognition for young students. The existing body of extensive vocabulary research examines techniques and strategies that assist all learners with acquiring new vocabulary. Missing from the literature is participant voice, as vocabulary research is done on students, not with them.

Results from this study provide preliminary findings about children's thinking while learning new vocabulary. While not employing established metacognitive research protocols, findings from spontaneous comments reveal emergent metacognitive understanding of print as a vocabulary learning tool. Comments such as "I'm going to try and

think of the picture in my head" and "When I say the word it makes the stuff in my brain" indicate student understanding of how thinking and pronunciation support recall. Findings also provide insights about how students process orthographic connections to enhance vocabulary acquisition.

Next Steps

To further understand metacognition during vocabulary learning, future studies should address tools for capturing student thinking. First, studies should include established metacognition research tools such as simulated recall, observations, interviews, or metacognitive self-reports. These tools may unlock understandings about how students tackle vocabulary learning. Second, research with students of multiple ages may uncover metacognitive changes in vocabulary learning across time. Research demonstrates that students with advanced metacognitive understanding use tools and strategies in more focused and targeted ways (Kragler et al., 2015). It remains unknown if or how learners use different tools or strategies as they move through K–16 schooling experiences.

Additionally, there is a need to understand the impact of curricular programs on metacognitive learning. Are differences in metacognitive skill development and usage apparent between students who learn to read with scripted basal programs versus language-focused programs? Finally, studying vocabulary techniques with more diverse learning populations is critical for enriching our understanding of language and metacognition function as classrooms across the globe face ever-shifting enrollment changes based on geopolitical conflicts and the impact of the COVID-19 pandemic on communities.

Conclusion

Researchers initially proposed that young readers lack metacognitive skills because of underdeveloped self-regulation skills, partial understanding of making meaning from print, and limited text comprehension tools. Now an extensive body of literature clearly demonstrates that young children activate metacognitive strategies while learning to read (Kragler et al., 2015; Lee & Schmitt, 2014; Martin & Kragler, 2011, 2012; Pratt, 2020; Pratt & Martin, 2017a, 2017b). This study focused specifically on an underreported area of metacognitive literacy research: vocabulary learning. Analysis of spontaneous comments from young students uncovered several entry points that beginning readers use to better facilitate learning new vocabulary words. Drawing from a growing body of research on orthographic facilitation's effect on vocabulary learning, findings demonstrate that young students (a) are metacognitively aware during vocabulary learning and (b) utilize orthographic facilitation as a vocabulary learning tool.

This study offers exploratory results and new directions for vocabulary research. As a vocabulary research community, we overlook the value of talking with students and exploring their ideas in depth. Decades of vocabulary research has resulted in multiple tools that increase depth and breadth of vocabulary knowledge as well as techniques that support age-appropriate and grade-appropriate vocabulary acquisition. It is now time to dig into why and how these tools support learning. The findings presented here offer new possibilities for inviting children and young adults into the conversation about their learning. Further work awaits to explore these possibilities.

About the Author

Dr. Susan J. Chambrè is an assistant professor of education at Marist College. Her research interests include emergent readers' vocabulary learning, orthographic facilitation, and teacher vocabulary word selection knowledge. She has presented internationally and nationally as conferences such as the American Educational Research Association and the Society for the Scientific Study of Reading. Her work has been published in journals such as *Reading and Writing* and *The Reading Teacher*.

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