Why Disciplinary Literacies Belong in the Primary Grades: Reviewing the Research through a Vygotskian Lens

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Although definitions vary, disciplinary literacy can be described as the ways in which members of a particular discipline read, understand, reason, and communicate their knowledge, since "Each field has its own ways of using text to create and communicate meaning" (Shanahan & Shanahan, 2014, p. 636). Different literacies call for different psychological tools, with specific domains requiring the development of "a set of particular, independent capabilities or of a set of particular habits (Vygotsky, 1978, p. 83). Such capabilities are acquired through a variety of interactions over time, and even young children can begin this acquisition process (Aguirre-Muñoz et al., 2021; Clark et al., 2021a, 2021b; Wright & Domke, 2019). This theoretical review describes disciplinary literacies in primary grades, examining how Vygotsky's sociocultural theory might support educators and researchers as they seek to introduce and understand disciplinary literacy practices in primary (K-2) classrooms.

Disciplinary literacies include engagement in discourses and practices, enacting disciplinary identities as knowledge that is both produced and performed. This "knowledge-in-action" (Moje, 2011, p. 50) includes ways of knowing, thinking, and acting that align with Vygotskian sociocultural principles. Development includes mastering "habits and forms of cultural behavior, the cultural methods of reasoning" (Vygotsky, 1929, p. 415). Vygotsky suggests that intellectual tools vary from one social context to another. This connects clearly to disciplinary literacies, which view disciplinary literacy development as an apprenticeship into "specialized ways of reading, writing, and reasoning" (Rainey et al., 2018, p. 373). Disciplinary literacies include socially constructed ways of organizing tasks and the physical and mental tools provided to master those tasks.

From a sociocultural perspective, formal education supports learners' development of psychological tools. Although some research has used sociocultural theory to frame acquisition of disciplinary literacies at the secondary education level (Athanases & Oliveira, 2014; Edwards-Grove & Freebody, 2021; Moje, 2007, 2010, 2015; Moje & Ellison, 2016; Moschkovich, 2015; Zhang et al., 2022), minimal research has been done at the primary education level to investigate young children's development of disciplinary literacies, and the existing literature lacks a theoretical foundation. There is a need to "theorize specific practices that might be useful under the actual conditions of schooling" (Moje, 2011, p. 68), especially in the early childhood grades. The purpose of this paper is to review the literature related to disciplinary literacies in kindergarten through second grade, to illustrate present and potential connections to Vygotskian perspectives in this extant literature, and to offer an expanded theoretical framework for considering this work.

A shift from researching and teaching content-area literacy to consideration of disciplinary literacies was spurred by the National Governors Association's (2010) release of the Common Core State Standards (CCSS), which emphasize disciplinary learning throughout K-12. There is debate about the applicability of disciplinary literacies in early education, with some (Ippolito et al., 2017; Shanahan & Shanahan, 2014) believing it is never too early to start, and others (Heller,

2010) believing K-12 teachers should not concern themselves with such specialized skills. Brock and colleagues (2014) outlined challenges facing the implementation of disciplinary literacies at the elementary level, including (1) limited relevant research (Lemly et al., 2019), (2) lack of a solid definition of disciplinary literacy (Fisher, 2019), (3) insufficient instruction using informational text (Strachan, 2015; Young & Goering, 2018), and (4) lack of foregrounding of disciplinary norms in elementary classrooms (Martin et al., 2021).

Aligning with those who claim that beginning disciplinary literacy practices early can lead to deeper understanding and abilities later, this article describes how Vygotsky's sociocultural theory can support educators and researchers as they seek to introduce and understand disciplinary literacy practices in primary (K-2) classrooms.

First, a brief literature review describing disciplinary literacies in primary grades is presented. This is followed by a discussion of practices aligning with sociocultural concepts that are currently present in scholarly conversations of disciplinary literacies in the primary grades. Additional sociocultural concepts that are not common in the current literature are then described, with elaboration on how they might benefit disciplinary literacy practices in the primary grades.

Disciplinary Literacies in Primary Classrooms

Online database searches for articles related to elementary grade disciplinary literacy revealed minimal research in the primary grades (K-2) as compared to the full K-5 elementary spectrum and secondary education. Additional searches were conducted using keywords such as *disciplinary literacy kindergarten*, *disciplinary literacy first grade*, *disciplinary literacy second grade*, yielding 16 articles related to disciplinary literacy instruction or standards in kindergarten through second grade published since initiation of CCSS in 2010. Because of the paucity of research in this area, scholarly discussions that are not research reports are included in this review. Table 1 lists the articles, their focus, and the discipline(s) and grade level(s) included.

Conceptual discussions on disciplinary literacies in the primary grades support a number of instructional practices in elementary school. Cynthia Shanahan and Timothy Shanahan (2014) advocate for science and literacy instruction to be integrated in second grade and suggest using read-alouds and literacy tools to support young students and encourage their active participation with science content and activities. Later, Timothy Shanahan (2019) describes the importance of disciplinary literacies in elementary grades and provides eight suggestions for primary school teachers to help prepare students for work in different disciplines: (1) build basic literacy skills and abilities, (2) develop extensive content knowledge, (3) expose students to disciplinary texts, (4) guide student reading and discuss informational texts, (5) develop disciplinary vocabulary, (6) work with multiple texts, (7) don't forget disciplinary writing, and (8) introduce disciplinary approaches (pp. 17-22). Many of these suggestions are demonstrated through other articles reviewed in this section.

Table 1
Articles Reviewed in This Paper

Article	Focus	Topic/Discipline	Grade level(s)
Aguirre-Munoz et al. (2020)	Instruction	STEM – Engineering	K, 1, 2
Britt & Ming (2017)	Instruction	Social Studies – Geography	Elem
Burke & Welsch (2018)	Expectations	Standards: Science & Social Studies	Elem
Cervetti & Pearson (2012)	Instruction	General	K-12
Clark et al. (2021a)	Instruction	STEM – Science	1
Clark et al. (2021b)	Instruction	STEM – Science	2
Colwell et al. (2022)	Instruction	General	Elem
Isidro (2021)	Instruction	STEM – Engineering	K, 1, 2
Martin et al. (2012)	Expectations	Science & Social Studies integrated literacy block	1
Oliver (2021)	Expectations	ELA – Reasoning	Elem
Parenti (2018)	Instruction	ELA – Guided Retellings	Elem
Picot (2017)	Instruction	STEM – Math	Elem
Shanahan & Shanahan (2014)	Instruction	General	Elem
Welsh et al. (2020)	Instruction	STEM – Science	2
Wright & Domke (2019)	Expectations	Standards: Science & Social Studies	Elem
Wright & Gotwals (2017)	Instruction	STEM – Science	K

Findings related to disciplinary literacy instruction in STEM provide hopeful results for those arguing for disciplinary literacies to be implemented beginning in early elementary grades. Integrating disciplinary literacies and engineering practices can lead to critical thinking in young students (Aguirre-Muñoz et al., 2021; Isidro, 2021). Aguirre-Muñoz et al. (2021) enacted a study with 18 teachers and 368 emergent bilingual students in grades kindergarten through second grade, in which they integrated engineering instruction with disciplinary literacy concepts, such as collaboratively defining terms, reasoning about science topics, and challenging others' contributions. This instruction, which also included cultural and linguistic accommodations, supported students' learning and engineering identity. Isidro (2021) conducted a study on a smaller scale with 15 kindergarten through second grade students in a summer camp. With appropriate differentiation, integrating disciplinary literacy concepts (such as collaboratively solving problems, planning and sharing ideas appropriately, and adapting ideas based on others' feedback) into engineering instruction resulted in students being able to critically think and reason through problems.

Similar conclusions have been reported by authors studying the integration of disciplinary literacy in science content. Scholars (Clark et al., 2021b; Welsh et al., 2020) have explored disciplinary literacy in second grade science contexts. Welsh et al. (2020) describe a classroom of 32 students who participated in an inquiry-based science unit on environmental stewardship, revealing that second graders' learning of science concepts, more than simple facts, could be supported through asking questions, conducting investigations, analyzing and interpreting data, constructing scientific explanations, and engaging in scientific discussion based on evidence with

peers. By participating in practices of the discipline—in this case environmental science and stewardship—and using reading and writing as a means to understand and communicate like scientists might, this inquiry-based teaching aligns with disciplinary literacies. Clark et al. (2021b) were specifically interested in the science informational texts that 45 second graders were able to write before and after disciplinary literacy instruction in science. Results indicate that using scientific text as model text can be an effective way to improve science informational text written by students, when chosen carefully and combined with intentional scaffolding from teachers. Focused on different aspects, these cases show the potential for teaching science content and scientific processes through a disciplinary literacies approach that uses reading and writing as tools for learning.

Studies have been conducted regarding disciplinary literacy in science below second grade as well. Clark et al. (2021a) conducted a separate investigation of 76 first graders to similarly determine abilities of writing science informational text] and to examine their perceptions of scientists. Though perceptions of what counts as a scientist remained mostly unchanged, results indicated that the integrated disciplinary literacy instruction, which included intentional science experiences and exposure to science informational text, was effective in increasing science concepts and writing. Wright and Gotwals (2017) conducted a quasi-experimental study in kindergarten. A total of 13 teachers and 147 students participated, receiving four weeks of an intervention plan which integrated disciplinary literacy concepts within a science unit. Some of these disciplinary literacy concepts included determining types of evidence acceptable in science, learning science vocabulary, and appropriately communicating findings with classmates. Results indicate that the treatment group outperformed the business-as-usual group in all assessed areas, while simultaneously developing oral language skills, productive science talk, and increasing both content knowledge and vocabulary use.

More work (Britt & Ming, 2017; Oliver, 2021; Picot, 2017) describes possible instructional strategies that could support disciplinary literacy learning in different content areas. Britt and Ming (2017) suggest ways of integrating disciplinary literacy into geography to improve students' abilities to engage with difficult and nuanced geography concepts. Suggestions include the adaptation of common instructional practices, such as read-alouds, paired texts, literature circles, and use of technology to include disciplinary concepts. Oliver (2021) describes five styles of reasoning that are important within instructional standards in the United Kingdom, explaining that these ways of reasoning develop first within cultures before being passed down as cultural tools to help students collaborate and think effectively within ELA and other disciplines. Picot (2017) emphasizes the value of using math word lists and making them easily accessible and interactive for students to use as a tool for conceptual development in math classes that incorporate disciplinary literacy concepts.

The work discussed above addresses disciplinary literacies in classrooms. Other researchers (Burke & Welsch, 2018; Wright & Domke, 2019) have examined instructional standards for academic areas such as science and social studies to determine the level of disciplinary expectations and the level of literacy included. Burke and Welsch (2018) describe a movement in Ireland that they suggest overemphasizes literacy and math instruction in elementary schools, to the detriment of science and social studies instruction. They report that vocabulary development, exposure to different text structures, examination of origin and authorship of texts, and

collaborating in inquiry-based learning might be practices that develop disciplinary understandings for students. They also suggest that focusing on these areas through integrated instruction might be one way to overcome policies they see as negative. Commentary from Cervetti and Pearson (2012) echo this notion of integrating literacy with other disciplines and carefully providing discipline-specific texts to enhance the inquiry process. Colwell et al. (2022) similarly discuss text choice and suggest that digital texts and tools might be a way for teachers to successfully integrate more disciplinary literacy instruction. Wright and Domke (2019) examined instructional standards, looking at the Next Generation Science Standards (NGSS) and the C3 Framework for Social Studies standards in the United States (National Council for the Social Studies, 2013). They found that 17% of science standards and 37% of social studies standards emphasize the importance of literacy and language, which they connected to disciplinary learning. They also found that shifts in expectations occur in both sets of standards between K-2 and 3-5 grade bands, to assist in the apprenticing of students into different disciplinary literacies. Because of these shifts, disciplinary literacy instruction is important before third grade, and might be most effective if begun when students enter schools in kindergarten.

Theoretical Frameworks in Disciplinary Literacy Research in Primary Grades

Although disciplinary literacies in early elementary settings are under-researched, work reviewed above establishes the value of disciplinary literacies instruction for young learners. Furthermore, such claims are strengthened when built on a strong theoretical foundation. To advance perspectives and approaches, theories should be reflected in the designs, methods, and analyses of research, and findings should be considered in light of the theoretical framework (Anders et al., 2014). Of the 16 pieces, nine do not discuss theoretical frameworks, one discusses an instructional framework only, and the remaining six discuss theoretical frameworks to various degrees. Some authors claim a certain theoretical framework with no further mention or consideration. For example, Wright and Domke (2019) present an examination of standards and include a theoretical framework section where they discuss sociolinguistic and sociocultural theories; however, no further connections are made to these theories.

Notably, disciplinary literacy itself seems to be playing the role of theoretical perspective in some articles. Oliver (2021) presents the most telling example, discussing the importance of disciplinary literacy research by stating, “This theory argues that disciplines have their own ways of reading, writing, communicating, and reasoning” (p. 706). Although the concept of disciplinary literacies can provide a framework for discussing pedagogy, it lacks the predictive power of theory.

As indicated by Wright and Domke (2019), disciplinary literacy concepts have clear connections with social theories, especially sociocultural theory. Ideas with potential connections to sociocultural theory are mentioned, though briefly, in all except one (Britt & Ming, 2017) of the articles reviewed, even though eight of the 16 pieces did not outright claim or discuss theoretical perspective. Sociocultural ideas that appear frequently include language and literacy as tools for learning, inquiry-based learning, collaborative learning, and communities of practice. Though these ideas could imply the work in which they are mentioned is framed with sociocultural theory, little attention is paid to theory in most cases. In addition, some terms are used in ways

incongruent with sociocultural theory. For example, scaffolding is often used to mean basic support given to students, not intentionally planned support for each child to help them accomplish what they cannot accomplish alone but can accomplish with a more knowledgeable other (Vygotsky, 1978). Further, some articles mention the Vygotskian term *knowledgeable other*, or *more knowledgeable other*, without reference to its theoretical significance beyond stating that young students need the help of their teachers to accomplish disciplinary literacy tasks and thinking (Clark et al., 2021a; Isidro, 2021; Martin et al., 2021; Wright & Gotwals, 2017).

Below, we make connections to core principles of sociocultural theory as described by Vygotsky, the originator of this theory; first, four concepts evident in previous research are highlighted; subsequent sections discuss Vygotskian concepts pertinent to disciplinary literacies but not present in extant literature (see Table 2). Since ideas were included in the research that both did and did not explicitly claim to be using sociocultural theory to frame the work, content from all articles reviewed is discussed as relevant.

Table 2
Vygotskian Theory Concepts in Early Childhood Disciplinary Literacies

Vygotskian Theory in Studies of Early Childhood (EC) Disciplinary Literacies (DL)
Language and Literacy as Tools for Learning
Inquiry-Based Learning
Collaborative Learning
Disciplinary Communities of Practice
Vygotskian Theory Applications Not Present in Extant EC DL Research
Obuchenie: The Teaching/Learning Process
Prolepsis: The End in the Beginning
Social Situation of Development:
Play: Imagined Roles and Situations

Vygotskian Theory and Early Childhood Disciplinary Literacies. Descriptions of disciplinary literacies and their practices in K-2 classrooms—as characterized in research and scholarship—include concepts aligned with Vygotskian sociocultural theory. However, in extant research, these alignments are undertheorized. Understanding of disciplinary literacies is enhanced when guided by theory as demonstrated below.

Language and Literacy as Tools for Learning. According to Vygotsky (1986), language plays a central role in development: "Thought is born through words" (p. 255); words function as tools and are the generative cause of concept formation. "Language is a primary mental tool because it facilitates the acquisition of other tools and is used for many mental functions" (Bodrova & Leong, 2007, p. 18). Language supports thinking, reasoning, reading, and writing (Vygotsky, 1978). Cervetti and Pearson (2012) intimate these ideas in their discussion of disciplinary literacies, advocating that "in any discipline—reading, writing, and language should not be the goals; instead they should be indispensable tools that students use alongside discipline specific tools" (p. 585).

Proponents of disciplinary literacy approaches recognize literacy as a tool for learning content (Brock et al., 2014; Cervetti & Pearson, 2012; Clark et al., 2021a; Clark et al., 2021b; Martin et al., 2021; Oliver, 2021; Parenti, 2018; Picot, 2017; Welsh et al., 2020). For example, Picot (2017) describes the potential for math word walls to serve as interactive tools to support students' understanding of mathematical concepts. In their study of 32 second-graders, Welsh and colleagues found that students' scientific collaboration improved through a focus on productive use of scientific vocabulary. Vygotskian principles elucidate the value of a focus on disciplinary word study: Vygotsky (1986) theorized that when interlocutors share sufficient content knowledge, words become "saturated with sense" (p. 247), allowing for meaningful dialogue.

An additional finding from Welsh et al. (2020) is that authentic writing supported students' active engagement with scientific processes and practices. Welsh et al. (2020) found that when second graders engaged with scientific content through written observations and discussions with peers, their scientific content knowledge improved. Clark and colleagues (2021b) also suggested that disciplinary literacy strategies are taught in primary classrooms as students analyze and craft texts in ways that are meaningful to the discipline. Sociocultural theory offers an explanation for the role of writing in disciplinary literacies development. Vygotsky (1978) explains that writing is a "complex cultural activity" that plays a significant role in children's cultural development. In formal schooling, he emphasizes that:

> Teaching should be organized in such a way that reading and writing are necessary for something…Writing should be meaningful for children, an intrinsic need should be aroused in them, and writing should be incorporated into a task that is necessary and relevant." (Vygotsky, 1978, p. 116-118)

Sociocultural theory clarifies how classroom language and literacy practices help young children develop the culture of a discipline and the disciplinary practices used therein.

Inquiry-Based Learning. Inquiry-based learning is another activity mentioned in the primary-grades disciplinary-literacies literature whose value is explicated through sociocultural theory. Many scholars have recommended the use of inquiry-based learning to help students gain disciplinary content knowledge and disciplinary literacy skills simultaneously (Aguirre-Muñoz et al., 2021; Britt & Ming, 2017; Brock et al., 2014; Burke & Welsch, 2018; Cervetti & Pearson, 2012; Martin et al., 2021; Welsh et al., 2020). Through inquiry, learners develop knowledge-in-practice in classroom settings, using particular practices, discourses, disciplinary facts and information, and conceptual frames. Inquiry offers opportunities for the iterative conceptual learning described by Vygotsky (1986).

Through a sociocultural approach, where psychological tools are co-constructed and directed toward essential characteristics of the content, learners' "naïve attitude toward objects in the external world" are "transformed into a 'scientific attitude'" that aligns with disciplinary literacies (Karpov & Bransford, 1995, p. 65). The teacher/mentor is a mediator between culturally developed tools and inquiry. Recent research highlights a necessary balance between direct instruction and exploration in inquiry learning (de Jong et al, 2023; Dobber et al., 2017; Hattie, 2009). This aligns with an often-overlooked aspect of Vygotskian perspectives: teaching

does not exclude explicit telling, or "verbal definition," passing along "scientific concepts" which are the cultural legacy of learning (Vygotsky, 1978, p. 148).

According to Vygotsky (1978), direct instruction should be combined with activity. Through inquiry, the teacher can support an interactive approach where both direct instruction and activity lead to learning. Although Glassman (2001, p. 9) suggests that the teacher builds a scaffold "so that the child can engage in understanding and development of scientific concepts on her own." Vygotsky emphasizes that development—including development of disciplinary identities—occurs "under adult guidance or in collaboration with more capable peers" (1978, p. 86) within a learner's zone of proximal development.

Vygotsky's (1978) concept of the zone of proximal development situates development as a joint problem solving or inquiry activity. The zone of proximal development "is the distance between the actual developmental level as determined by independent *problem solving* and the level of potential development as determined through *problem solving*" in collaboration (p. 86, emphasis added). In inquiry activities, the problem is often sown by the teacher. Inquiry creates active learning environments "quite different from the passive reception of assigned knowledge that too often dominates classroom interactions" (Brown & Campione, 1990, p. 123).

Harnessing the power of language described above, Welsh et al. (2020) demonstrate that second-grade students who engaged in an inquiry-based learning unit on environmental science gained science content knowledge and disciplinary skills through hands-on investigations and scientific discourse with peers, which increased their engagement with scientific processes and practices. Contrastingly, Martin et al. (2021) found that when teachers failed to emphasize students' inquiry and limited the time spent using discipline-specific skills for meaningful tasks, students' content knowledge and disciplinary literacies knowledge and identities were not fostered.

Authentic use of reading and writing in inquiry fits Vygotsky's (1978) call for teaching to use these tools in purposeful ways. Cervetti and Pearson (2012) suggest that using textbooks instead of intentionally choosing science texts for students to read positions students as "receivers of facts" (p. 585). Conversely, having students read in conjunction with inquiry-based learning positions students as scientists using disciplinary texts to uncover facts or create meaning.

Discussing learning in educational settings, Karpov (2003) claims, "The new-Vygotskians argue that scientific knowledge that students should learn at school cannot be reduced to scientific concepts; it should also include procedural knowledge (that is, subject-domain strategies and skills) relevant to these concepts" (p. 149). Inquiry-based learning can position students as members of a discipline through active exploration and use of discipline-specific tools (e.g. engineering design process) to solve problems authentic to the discipline (e.g., designing a bridge that can hold the most weight with the least amount of material waste). Aligning with the Vygotskian principle that knowledge is constructed using cultural tools, inquiry-based learning provides an authentic opportunity for students to use tools of the disciplines to understand and solve problems and to communicate solutions.

Collaborative Learning. Inquiry learning is often conceived as an opportunity for collaboration, which is a foundational sociocultural tenet. Vygotsky described development as a social process

informed by cultural contexts. He emphasized the role of mediation; knowledge is not merely constructed, it is co-constructed. Both teachers and peers might support learners in reaching their potential within their zone of proximal development. Working collaboratively, "the action or the suggestion of one student helps other partners to reflect on their own actions" (Zuckerman, 2003, p. 193). By working together, the group "is able to construct a solution that none could have achieved alone" (Wells, 1999, p. 324). Shared activity in small-group collaborative work may include "generative, constructive, experimental, developmental speech" (Smagorinsky, 2007, p. 65). Concepts are formed when words are applied socially in multiple ways (Vygotsky, 1987). Social interactions involving collaborative dialogue promote development of higher mental functions such as mediated perception and logical thinking that align with disciplinary practices.

Sociocultural theorists describe collaborative work designed by the teacher to "organiz(e) the students' learning activity as interaction and cooperation" that leads students to "acquire the necessary means and develop attitudes directed toward…understanding and applying the material to be learned with regard to the specific subject matter or content" (Giest & Lompscher, 2003, p. 270).

Scholars suggest collaborative learning when working with disciplinary concepts in the primary grades (Aguirre-Muñoz et al., 2021; Isidro, 2021; Martin et al., 2021; Nunamaker & Mosier, 2022; Oliver, 2021; Welsh et al., 2020; Wright & Gotwals, 2017). For example, in their study of emergent bilingual students in grades K-2, Aguirre-Muñoz et al. (2021) found learning that included collaboratively defining terms, collectively reasoning about science topics, and challenging others supported both learning and construction of an engineering identity. Similarly, Isidro (2021) worked with 15 K-2 students at an engineering summer camp and reports that students were able to think and reason more critically after instruction including collaborative problem solving, planning and sharing ideas with classmates, and using peer feedback. These conclusions are echoed by a quasi-experimental study of 13 teachers and 147 kindergarteners, in which Wright and Gotwals (2017) found that four weeks of intervention—including integrated disciplinary literacy and collaborative learning—led to development of oral language skills, productive science talk, and an increase in content knowledge and vocabulary use.

When disciplinary literacy approaches call for collaborative learning, these practices draw upon a crucial aspect of sociocultural theory. Beyond explanations of development through social interaction, Vygotsky posits that any development of the individual psyche is *first* a real relation with another person (Vygotsky, 1987):

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first *between* people (*interpsychological),* and then *inside* the child (*instrapsychological*)…All the higher functions originate as actual relations between human individuals. (Vygotsky, 1978, p. 57; emphasis in original)

Social interaction is an inherent feature of development, including the development of disciplinary skills and identities in young children.

Disciplinary Communities of Practice. Working in the disciplines invokes collaboration that uses the tools specific to that domain. Through instruction that promotes student interaction and collaboration using these tools, communities of practice may be created in classrooms. Communities of practice support social processes of negotiating competence in a domain over time (Wenger, 1998). Participants in communities of practice have varied explicit knowledge and practical experience, and they support one another in the activities relevant to their community.

Sociocultural approaches provide a foundation for understanding learning in communities of practice (Gunwardena et al., 2009; Schwen & Hara, 2003; Takahashi, 2011; Wang et al., 2013). Learning in the academic domains in ways that align with disciplinary cultures is supported by the Vygotskian principles that development cannot be separated from its sociocultural context and that knowledge is constructed using cultural tools (Vygotsky, 1978). Vygotsky (1986) argues that culture is the primary determining factor for construction of knowledge; we learn through this cultural lens by interacting with others and by following the rules, skills, and abilities shaped by that culture. Disciplinary communities of practice have "a shared repertoire of resources: experiences, stories, tools, (and) ways of addressing recurring problems" with the intention that community members learn with and from each other (Wenger-Trayner & Wenger-Trayner, 2015).

The spiraling learning through interactions among individuals and their environments described by Vygotskyy (1986) occurs as individuals negotiate their relationship with the learning environment and the people in it (Goos & Geiger, 2010). Communities of practice provide a living experience of meaning negotiation, moving beyond a teacher-pupil ethos to consider possibilities and problems in application (Schwen & Hara, 2003). Learners collectively negotiate the meaning of the tools and processes of their work through shared practice. Making meaning within communities of practice, learners conceptualize group identities (Takahashi, 2011).

Echoing the concept of communities of practice, Gee (2019) describes *discourses* as "identity kits" (p. 111), ways of "talking, listening, writing, reading, acting, interacting, believing, valuing, and feeling" (p.111) that differ based on the groups into which one is socialized. Such identity kits are associated with disciplinary communities of practice. Through social interaction using disciplinary tools, students may begin to create disciplinary identities. Studies have found that primary-grade students sometimes hold gendered stereotypes that could potentially be disrupted through sustained instructional activity in communities of practice (Aguirre-Muñoz et al., 2021; Clark et al., 2021a) leading to adoption of disciplinary identities.

Social context plays a key role in the development of primary-school children's disciplinary identities and disciplinary literacies. Wright and Gotwals (2017) describe how young students join communities of practice through disciplinary literacies, concluding, "Thus, as students learn science, they begin to engage in the practices of the science community" (p. 515). Similarly, Martin et al. (2021), in their study of four first-grade teachers' integrated instruction blocks, explain, "Students' early apprenticeship into disciplinary communities is situated and constructed through…peer-to-peer engagement, and by firsthand experience" (p. 89). These studies suggest that young children can acquire disciplinary literacies through engaging in work consistent with theoretical conceptions of communities of practice.

Additional Opportunities for Sociocultural Theory Application. Previous research on disciplinary literacies development in the primary grades has included such practices as recognizing language and literacy as disciplinary tools and inquiry as a problem-solving activity, using such tools individually and collaboratively within communities of practice. In addition to the sociocultural applications described above, opportunities exist for application of sociocultural theory for development of disciplinary literacies within the primary grades that have been unrepresented or underrepresented in past research.

Obuchenie: The Teaching|Learning Process. Founding explorations of disciplinary literacy development within a sociocultural perspective supports an understanding of the relationship between teaching and learning. The Russian term *obuchenie* is not easily translated into English but reflects teaching, learning, and the relationship between the two—the integrity of teaching|learning. Not having an English word that encompasses this relationship might indicate that the process is often thought of as separate but related parts, rather than a unified process.

In his description of the development of scientific concepts in childhood (Vygotsky, 1978), Vygotsky emphasizes the role of *shkol'noe obuchenia,* or school teaching|learning, a reminder that, in his view, formal instruction plays a key role in development. However, our view of formal instruction should not be that of learners passively receiving knowledge. Rather, as described above, Vygotsky's *obuchenie* is an active, collaborative process.

Obuchenie relays a complex and interactional view of development that encompasses an emergent, contingent, and responsive education. This "teacher student instructional and learning interaction" (Wertsch & Sohmer, 1995, p. 333) is a double-sided process (Cole, 2009) leading to "the acquisition of many specialized abilities for thinking" (Vygotsky, 1978, p. 83), such as specialized, disciplinary thinking. *Obuchenie* supports "the development of a set of particular, independent capabilities or of a set of particular habits" (Vygotsky, 1978, p. 83)—including those particular to a discipline. These particular capabilities provide "the basis for the subsequent development of a variety of highly complex internal processes" (Vygotsky, 1978, p. 90).

Obuchenie teacher-learner dialectics include "psychological tools and semantic-pragmatic explanations of those tools to promote conscious awareness and a functional understanding of academic (scientific) concepts in ways that facilitate the reorganization of the learner's mental structures" (Johnson, 2015, p. 517). This description of *obuchenie* has clear application to teaching|learning the tools of disciplinary literacies within students' zones of proximal development. Pedagogical approaches to inquiry, collaborative learning, and language and use of language and literacy tools within communities of practice are also enhanced by an understanding of the interrelatedness of teaching and learning.

Prolepsis: The End in the Beginning. Another Vygotskian concept that aligns with primary-grades teaching|learning of disciplinary literacies is *prolepsis. Prolepsis* is an anticipatory approach, the representation of a future act or development as presently existing. Vygotsky (1994) suggested that in prolepsis, "something which is only supposed to take shape at the very end of development, somehow influences the very first steps in this development" (1994, p. 345). To describe prolepsis, Cole (1998) uses the analogy of embryonic development: The genetic code that foretells the emergence of five nubby fingers on a human embryo is assembled from

the past when sperm and egg unite. *If conditions are right*, the nubbins "become a five-fingered hand, with muscles, bone, tendons, and nerve cells situated as the human hand" (p. 183). In prolepsis, "The past enters the future so that the end is in the beginning" (Peñaflorida & Collet, 2019). Introducing disciplinary literacy tools in the primary grades promotes their unfolding.

If disciplinary practices are to be evident "at the very end of development" (Vygotsky, 1994, p. 345), they should be included at the beginning of formal schooling, including kindergarten through second grade. In the early grades, the "'buds' or 'flowers' of development" characterize disciplinary literacies prospectively, in the dynamic developmental state of their formation (Vygotsky, 1978, pp. 86-87).

Vygotsky (1986) stated, "The only good kind of instruction is that which marches ahead of development and leads it" (p. 188). Instruction "marches ahead" of development when meaning is socially constructed through interactions in which the teacher acts as if the learner already possesses the needed skills and then implicitly offers ways for the learner to come to understand those assumptions. The learner is made an insider as the teacher assumes a taken-for-granted social reality and supports active construction of shared meanings. The development of disciplinary literacies through a balance of techniques that includes both this *proleptic instruction* and also demonstration and explicit teaching is consistent with Vygotsky's descriptions of instructional situations (Stone, 1985).

Although there is some hesitation in the literature about beginning disciplinary literacies instruction in elementary grades, scholars purport that discipline-specific building blocks are as appropriate as general literacy abilities in these younger years (Cervetti & Pearson, 2012; Clark et al., 2021a). In proleptic teaching|learning, current concerns are linked with future challenges through transmission of collectively held frameworks and identities as learners construct possible futures (Brescó de Luna, 2017).

Given findings regarding scientific identities (Aguirre-Muñoz et al., 2021) and perceptions of scientists (Clark et al., 2021a), preparing students for careers in science begins much earlier than secondary school settings. Early experiences with disciplinary literacies create social scripts through which people guide themselves and others toward future goals and expectations. New presents—here-and-now experiences—open different possible futures (Brescó de Luna, 2017). Since expectations mediate actions and channel the present toward an imagined future (Cole, 1998), including disciplinary literacy practices early in schooling might provide diverse experiences that serve students as they form personal identities and make eventual career decisions.

Social Situation of Development: Relations between Child and Society. Another Vygotskian concept underrepresented in disciplinary literacies literature is the *social situation of development.* In Vygotsky's theory, the social situation of development is the "unique relation, specific to a given age, between the child and reality, mainly the social reality that surrounds him" (Vygotsky, 1998, p. 198). Characteristics of the child combine with characteristics of the social environment to initiate developmental changes. School cultures have a concept of an early-grade student—how they should act and what they should do. Children live out these expectations, with teachers playing a crucial role within the social situation of development.

Development is influenced by the cognitive and social-emotional abilities of the child, the way that adults interact with the child, and what they expect from them. This relationship between characteristics of the child and the structure of social interactions plays a crucial role in a child's development of higher mental functions and formation of concepts. The structure of social interactions includes experiences and expectations. In relation to young learners, it is helpful to examine the expectations for and experiences of early-grade children in relation to disciplinary literacies.

Dobber et al. (2017), in their review of inquiry learning, emphasize learning as "a social process of co-constructing knowledge, in which the teacher should play a crucial role," providing scaffolding that positively effects students' knowledge development, reasoning skills, motivation, and self-regulated learning (p. 195). The studies reviewed by Dobber et al. illustrate that, consistent with Vygotskian principles, teacher facilitation enables students to adopt new social discourses. By suggesting cultural means (in this case, the cultural means of inquiry), the teacher facilitates the creation of a cultural behavior, affording development of the child (Sheridan et al., 2018).

Dobber and colleagues additionally described how guidance is distributed among teacher and students during collaborative inquiry learning. This social situation includes a web of relationships among the teacher and students that seems to support disciplinary literacies development. Children's perceived needs specific to that social situation spur development. Institutional norms can introduce the child to a new relationship to the world. According to Vygotsky (1998), the social situation of development "determines wholly and completely the forms and the path along which the child will acquire ever newer personality characteristics" (p. 198), such as the characteristics of specific disciplines. Being treated as a child who has the ability to enact disciplinary literacies actualizes their development.

Although eight of the reviewed articles on disciplinary literacies in the early grades mention ideas potentially associated with the social situation of development (e.g., more-knowledgeable others, collaborative learning) other aspects of the social situation of development, such as classroom and school expectations placed on the children, were not acknowledged and might fruitfully be considered. Concerns have been raised about a lack of awareness of formal schooling dynamics during discussions of disciplinary communities in classrooms (Fisher, 2019).

One study by Wright and Domke (2019) addressed expectations placed on elementary students in the standards frameworks for science and social studies, and determined that "enacting the vision of these standards will likely require substantial instructional change in many elementary classrooms" (p. 26). The inquiry and collaborative learning environments described in the above-mentioned studies do not reflect the social situation of development in many school cultures. Expectations for "how we do school" in the primary grades have shifted due to accountability measures, with children as young as kindergarten (and even preschoolers) expected to participate in didactic instruction, dictation, and rote work as the bulk of their learning experience (Bassok et al., 2016; Carlsson-Paige et al., 2015; Haslip & Gullo, 2018). Even the physical environment of these classrooms has changed. For example, Bassok and colleagues' (2016) survey results indicated a drop of over 20% between 1998 and 2010 in kindergarten classrooms offering a

dramatic play area, a science or nature area, or a water or sand table, environments that might support inquiry.

For young children, an effective social situation of development includes activities with a learning task, learning actions, feedback, moments for student self-assessment or self-reflection, and elements of motivation (Bodrova & Leong, 2007). Young children benefit from support when engaging in such learning activities, including intentional work with peers, as is common in inquiry-based learning, with the teacher acting as "a moderator of ideas" (Bodrova & Leong, 2007, p. 177). Through oral discourse, students can be apprenticed into disciplinary literacies even before they are reading and writing independently (Wright & Domke, 2019).

Describing child development and the social situation of development, Bodrova and Leong (2007) state, "Along with acquiring specific competencies for each period of life, children are constantly developing other skills and capacities, laying the groundwork for achieving the more complex competencies of the next period of their development" (p. 97). Viewed through this developmental lens, disciplinary literacy is worth beginning in primary school, even if students cannot fully conceptualize and achieve certain feats on their own.

Vygotsky emphasizes that the social situation is "specific to a given age" (Vygotsky, 1998, p. 198). Because young children construct knowledge and make meaning through interactions with adults and peers and through active exploration and play, including such opportunities is important for creating a productive, social situation of development (National Association for the Education of Young Children, 2020).

Play: Imagined Roles and Situations. The concepts of *obuchenie*, prolepsis, and social situation of development—found in Vygotsky's theory but not discussed in the articles in this review—could strengthen the argument for and the understanding of the place of disciplinary literacy in the primary grades. Additionally, play, which Vygotsky considered to be a leading factor of development in early childhood (Vygotsky, 1978), has received minimal attention in relation to the development of disciplinary literacies (Nunamaker et al., 2022). We turn now to a discussion of play in disciplinary literacy development, with its potential for drawing together the affordances of sociocultural theory discussed above.

The development-inducing play of early childhood described by Vygotsky includes an imaginary situation, taking on and acting out roles, and following social rules determined by those roles (Vygotsky, 1978). Sociodramatic play "is the source of development and creates the zone of proximal development" for young children (Vygotsky, 1967, p. 16). Within this zone, children experiment with challenging skills and acquire cultural competencies. When young children play at reality, "the imaginary situation already contains rules of behavior" (Vygotsky, 1967, p. 9). This sociodramatic play has clear implications for disciplinary literacy development. Through such play, young children can take on disciplinary identities and practices.

According to Vygotsky (1978), "The child in playing tries to be what she thinks she should be" (p. 95). Teachers in early-grade classrooms can harness the developmental process of sociodramatic play for disciplinary literacy learning, mediating children's play by presenting social roles and expectations and offering opportunities to practice those roles. "Real life

becomes a rule of behavior in play" (Vygotsky, 1967, p. 10). As teachers offer or model cultural tools of different disciplines, these rules of behavior in play can apprentice students into the disciplines through imagination. The "imagined identities they portray in play" project future possibilities (Kendrick, 2005, p. 25). "Play serves as the mode of inquiry and autobiographical expression" to bring an "imagined future life into view" (Kendrick, 2005, p. 22).

Significant development occurs through play. According to Vygotsky (1967), "A child's greatest achievements are possible in play" (p. 14). "In play, a child is always above his average age, above his daily behavior; in play, it is as though he were a head taller than himself" (Vygotsky, 1967, p. 16). Offering opportunities for discipline-based sociodramatic play could incite development of disciplinary literacies. Vygotsky described play as the means for developing abstract thinking, representing one thing symbolically as another. Writing is an example of this second-order symbolism: the written stands for the real. Make-believe play can be a contributor to the development of the second-order symbolism of written language (Thompson & Stanković-Ramirez, 2021). Forms of disciplinary reading and writing can become necessary in play as children take pretended roles as members of disciplinary communities of practice. Within such play contexts, reading and writing are "necessary for something" (Vygotsky, 1978, p. 117), as described above. For example, when playing doctor, a child might read an x-ray or write a prescription; a child playing paleontologist might draw and label their "findings" or reference a book for identification. Sociodramatic play centers—intentionally designed to support disciplinary literacies development—could elicit practices such as these.

Early research on literacy and play was conducted by Neuman and Roskos (1991, 1997), who grounded their research in Vygotsky's work. To augment children's play, they offered themed prop boxes (e.g., post office, library, doctor's office) that included literacy items based on appropriateness, authenticity, and utility (e.g., envelopes, stamps, bins, and trays in the post office box). Adults foregrounded literacy play through activities such as read-alouds, discussions, and sometimes field trips, providing schema for children's activity. Children's play behavior was recorded and analyzed. They found that including "authentic literacy contexts in play inducts children into the culture of literacy, where they may ultimately adopt the discourse patterns, ways of knowing, and cultural practices of the literate community" (1991, p. 233). Although the term had not been introduced at that time, children appeared to adapt disciplinary literacies through their play when "exposed to the domain's conceptual tools in practical activity" (Neuman & Roskos, 1997, p. 30).

The 1990's saw burgeoning interest in literacy-enriched play centers (Christie & Stone, 1999; Dever & Wishon, 1995; Einardottir, 1996; Neuman & Roskos, 1992, 1993; Pickett, 1998; Roskos & Neuman, 1993; Vukelich, 1994). However, with the publication in the U.S. of the National Reading Panel Report at the turn of the century, attention turned away from play and toward skills-based instruction (NICHHD, 2000). In light of the potential for disciplinary literacy development, revisiting literacy-enriched play is warranted. Additionally, although previous research in the literacy-play connection has focused mostly on preschool-aged children, sociodramatic play continues through the early-elementary years and could be harnessed to provide collaborative, inquiry-based opportunities for disciplinary literacy development. Through play, teachers can design social situations of development and provide authentic

learning activities with disciplinary contexts and appropriate tools for students to use while engaging in these meaningful experiences.

Incorporating play that includes collaborative inquiry could create literacy-rich teaching|learning experiences that foreshadow disciplinary communities of practice. Vygotsky stated:

> Play gives a child a new form of desires. It teaches her to desire by relating her desires to a fictitious "I," to her role in the game and its rules. In this way, a child's greatest achievements are possible in play, achievements that tomorrow will become her basic level of real action. (1978, p. 100)

Play creates a proleptic social situation for development of disciplinary identities and literacies.

Recommendations

The paucity of research on disciplinary literacies in the primary grades, along with Vygotskian principles pointing to the potential value of integrating disciplinary literacies in early-learning experiences, suggests implications for research and practice.

Some previous work on disciplinary literacies in the early elementary grades has called upon sociocultural theory to consider the roles of language and literacy, inquiry, collaborative learning, and communities of practice. This limited research base could be built upon in future research. Additionally, because the theoretical considerations in existing studies have been minimal, expanding use of theory in future studies of these pedagogical practices for disciplinary literacies could enrich methods, analyses, and findings. Examination of the theoretical frameworks within the reviewed articles showed use of theory within the introduction or the theoretical perspectives section without further connections to interventions chosen, analyses made, and findings being reported. Extending sociocultural theoretical connections could enhance research designs, methods, analyses, reported outcomes and implications for practice (Anders et al., 2014).

While some sociocultural concepts have been included in conversations about disciplinary literacies, other concepts have not been explicitly discussed. These missing concepts have the potential to strengthen use of sociocultural theory as a framework for disciplinary literacies and to situate disciplinary literacy practices more clearly in primary grades.

Consideration of the Vygotskian concepts of *obuchenie* (teaching|learning) and *prolepsis* (the end in the beginning) enhances understanding of the social situation of development (relations between the child and societal expectations). Examining teaching and learning as part of the same process provides insight related to interactions among participants (both teachers and students). Emphasizing societal expectations for students, both present and future, could provide insight regarding developmentally appropriate practice, while acknowledging that learning leads development.

Further, the potential role of play in disciplinary literacies development is unexplored and ripe for research. Rand and Mandel Morrow (2021), in their review of research linking literacy and play in early education, have called for restored inclusion of literacy through sociodramatic play

and have emphasized the role of adult guidance during play to optimize such learning. Although these authors did not connect such learning experiences with disciplinary literacies, their description of development of functional literacy could be expanded to include disciplinary literacy opportunities. Research examining connections between sociodramatic play and development of disciplinary literacies, through a sociocultural framework, could expand understanding of this interaction and provide further implications for practice.

Implications

Scholars have previously called for inquiry-based and collaborative learning as practices for developing disciplinary literacies in early elementary grades. Tenets of sociocultural theory support early-grade teachers' understanding of these practices as developmentally appropriate for their students. Additionally, sociocultural theory supports the expansion of early-grade teachers' instructional repertoire to incorporate play—with inquiry and collaboration embedded—for the purpose of developing disciplinary literacies. The literacies of scientists, historians, and mathematicians, along with those of other disciplines, could be supported by teacher read-alouds, discussions, and field trips, providing schema for children's disciplinary activity.

A deeper consideration of theory in practice might encourage disciplinary literacies at the early-elementary level. About one-third of the articles included in this review were published in journals targeting a practitioner audience. Only one of these articles highlights theory (Isidro, 2021). Including discussions of theory in articles for practitioners might encourage connections between their own teaching philosophies and instructional practices, bridging the gap between research and practice, between theoretical considerations of instruction and actual instruction taking place in classrooms.

Conclusion

Vygotsky believed that knowledge is constructed using cultural tools, development cannot be separated from its sociocultural context, learning can lead development, and language and literacy play a central role in development. These key principles can be expressed through disciplinary processes such as inquiry-based learning and communities of practice. The argument that disciplinary literacies belong in the primary grades can be further supported through additional concepts from sociocultural theory such as *obuchenie*, prolepsis, social situation of development, and the inclusion of mediated play in instruction. Connecting sociocultural theory and disciplinary literacies could joyfully enhance the early-grades curriculum.

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