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Utilizing Complexity Theory to Examine the Texas Science of Teaching Reading Standards

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Abstract

Legislation based on the Science of Reading has spurred changes in teacher preparation and K-12 schools. Texas, a frequent leader in educational policy, adopted its own Science of Teaching Reading (STR) Framework with a focus on scientifically based instructional practices. Adoption of these standards is intended to improve methods of teaching reading within teacher preparation and, by extension, improve reading instruction in schools. To understand how the Texas STR standards defined and related the elements of learning environments, including reading, teaching, and learners, a content analysis of the STR framework informed by complexity theory was conducted. Themes include (A) teaching as adherence to research-based practices, (B) a stand-alone view of reading that minimally attends to writing instruction, (C) a stage-based and simple view of reading, and (D) minimal attention to sociocultural factors. Overall, findings suggest that the STR standards lack specificity, barely mention relevant research, and fail to sufficiently address the role of race, culture, ethnicity and other sociocultural factors in reading instruction. The implications of these drawbacks of the STR standards, especially as they provide guidance to educator preparation programs, are discussed.

Keywords: science of reading, content analysis, complexity theory, initial teacher preparation

Recent debates over the Science of Reading (SOR) have been fueled by state policy, popular media, and reading research. As in previous years, these debates often reduce a vast and complex research base to a conflict between phonics-based methods and/or structured literacy and balanced literacy and/or whole-language approaches (Pearson, 2016; Tierney & Pearson, 2024). Popular media sources (e.g., Hanford, 2018; 2023) describe the SOR as a settled science and suggest that teaching informed by SOR will eliminate the achievement gap in reading. Some researchers question whether SOR-driven instruction offers narrow explanations for reading problems given other influences on educational outcomes, such as sociocultural factors and childhood poverty (Durán & Hikida, 2021; Harrison, 2010). Furthermore, translating reading research into pedagogy is no simple task (Coburn & Woulfin, 2012; Lammert et al., 2022), and research on how to teach reading processes and skills continues to develop (Seidenberg et al., 2020).

A particular challenge has been translating research on reading processes from fields such as psychology and neuroscience into curricular practice and instruction (Seidenberg et al., 2020). To address this need, scholars of implementation science have promoted design-based studies that test reading instructional practices in contextualized settings (Shanahan, 2020). However, different instructional practices can be considered evidence-based depending on which research methods are used, and which theoretical models of reading development drive the research design (Goodwin & Jiménez, 2020; Grote-Garcia & Ortlieb, 2023). Practitioners, such as beginning teachers, are often lost in this gap (Coburn & Woulfin, 2012; Solari et al., 2020).

Despite ongoing debates about how to translate reading research and cognitive science into instructional methods that are effective for students in our diverse contemporary classrooms, legislators are increasingly mandating specific instructional practices for the teaching of reading (Schwartz, 2020). In Texas, a state that is traditionally a forerunner in policy (Cassidy et al., 2016; Worthy et al., 2018), the state legislature voted in support of SOR policies in 2019 and adopted the Science of Teaching Reading (STR) standards for initial teacher preparation and certification in 2020 (Texas Education Agency [TEA], 2022). The STR informs educator preparation programs by defining the components of reading development, instruction, and assessment teachers must master to earn state licensure, and by playing this role, it informs the practices used to teach reading in K-12 classrooms. Given the important role the Texas STR standards play in shaping the practices used in educator preparation programs, we conducted a content analysis (DeJulio et al., 2021) of Texas' STR standards informed by complexity theory (Byrne, 1998; Gear et al., 2018) and focused on three core elements of the STR standards: teaching, reading, and learners.

Theoretical Framework

Complexity theory conceives of systems as holistic entities comprised of dynamic constituent parts. Understanding complex systems, such as classroom environments for teaching reading, requires attention to how these parts interact, develop, change, and evolve across different levels and time (Byrne, 1998; Gear et al., 2018). Change within systems occurs through disequilibrium between system elements and shifts due to self-organization, feedback, and emergence. That is, change in complex systems happens due to unpredictable, dynamic interactions between system elements (e.g., people, organizations, policies). Here, we conceptualize standards such as the STR, which are intended to represent the total of what teachers of reading should know and be able to do, as representing the complex system of reading development. A complexity perspective provides a lens through which to examine how the repeated and/or dominating presence of some elements of the STR standards reduces attention to other elements. Furthermore, conducting content analysis through the lens of complexity theory enables us to uncover the explicit and implicit messages embedded in the STR standards through the topics left minimally mentioned or ignored.

In this way, complexity theory offers an alternative to reductionist perspectives that distill complex phenomena into isolated factors (Byrne, 1998). Isolated knowledge may provide short-term insights into teacher education, but it typically falls short of providing sufficient evidence as to why long-term patterns in learning outcomes persist (Cochran-Smith et al., 2014). In parallel fashion, content analysis can reduce texts to smaller components that lack meaning, suggesting the need for a complexity perspective on content analysis methodology (Yoon et al., 2018). We argue that complexity theory is useful in content analysis because it conceives of systems as holistic units rather than discrete, individual parts (Byrne, 1998). From this perspective, the 'content' of systems such as the STR standards can be understood by examining patterns of interaction between different system elements (Gear et al., 2018). Taken together, a content analysis informed by complexity theory allows for examining messages and discourses across and within a system.

Teaching Reading as a Complex System

Conceptualizing the teaching of reading as a complex system begins with the assumption that teaching reading cannot readily be simplified into linear, manipulable components; instead, teaching and learning rely on understanding the dynamic, changing interactions of teachers and learners with texts as they engage with the reading process (Davis & Sumara, 1997). This is not to suggest that

specific reading skills and processes are unimportant in teaching and learning; however, understanding reading instruction requires attention to the multidimensional and intersecting elements of learning environments needed to support readers (Compton-Lilly et al., 2020). Further, preparing teachers using the STR standards to understand the components of reading in isolation, rather than collectively, may inadequately support educators in navigating situations in real classrooms (Coburn & Woulfin, 2012; Cochran-Smith et al., 2014).

In this study, complexity theory provided a lens to examine Texas' STR standards that went beyond a descriptive explanation of the STR Domains and Competencies to an examination of how elements interact with one another within the standards (Byrne, 1998). We chose this framework knowing that a complex system like reading cannot be fully understood through the identification and labeling of individual elements. Instead, we based our analytic process on the understanding that no single recommendation for reading instruction can come without considering what else might have taken the place of a particular learning practice.

Review of Literature

First, we contextualize the current study by describing the role of standards in initial teacher preparation. Then, we review what is known about the three key learning environment elements underpinning our research questions which are teaching, reading, and learners.

The Role of Standards for Teacher Preparation

The STR framework defines what future teachers must know and be able to do as teachers of reading. TEA describes the standards as informing "proper teaching techniques, strategies, teacher actions, teacher judgments, and decisions" (2022, n.p.) by connecting theory and practice. They have suggested that the adoption of the STR standards will lead to improved teacher preparation and, ultimately, improved reading achievement for K-6 students (TEA, 2022). However, the adoption of the STR standards alone does not ensure that the content of literacy methods courses will change, as teacher educators still control the content of coursework.

In the past several decades, the federal Department of Education has adopted a standards-based accountability approach to K-12 education (DeBray, 2006). With the advent of state SOR standards, this same accountability approach now guides the preparation of K-12 teachers. Currently, the federal government interfaces with accreditation bodies (e.g., National Council for Accreditation of Teacher Education, [NCATE], 2008), and these accreditation bodies interface with teacher education programs to ensure that initial certification programs promote evidence-based practices. Typically, accreditation agencies provide standards for teacher learning but allow program flexibility in developing course sequences to address those standards (Cochran-Smith & Zeichner, 2005). Organizations such as the International Literacy Association (ILA) may also weigh in on their view of teacher education practices for literacy (i.e., ILA, 2018). Research on how closely teacher education course curricula align with teacher preparation standards suggest mixed results. One analysis indicated that standards "enable fairly consistent content delivery in preservice courses" (DeLuca & Bellara, 2013, p. 366). When teacher educators refine coursework to improve its alignment with standards, it often results in improved teacher learning of that content (Purcell & Schmitt, 2023).

In addition to accreditation procedures and research, preservice programs in Texas are monitored for adherence to STR standards through a required certification exam. Teacher preparation programs must demonstrate to TEA that coursework is aligned with STR standards and that teacher candidates across multiple degree plans, including Early Childhood–Grade 6 Generalists, Grades 4–8 English Language Arts and Reading, and Grades 4–8 Social Studies teachers, are assessed on these standards. Some accreditation bodies rely on students' pass rate on certification exams as one measure of program efficacy, and STR is included among those exams (Council for the Accreditation of Educator Preparation, 2022). The combination of these accountability pressures suggests that Texas' STR standards are likely to impact course content in Texas preservice teacher education programs.

Element One: Defining Teaching

In understanding the function of the STR standards, it is important to review what is known about teaching reading. First, the SOR has been the focus of much attention in literacy research (Goodwin & Jiménez, 2020). However, less clarity exists around the Science of *Teaching* Reading (STR). For example, while the ILA maintains a glossary of key terms in literacy research, they define the SOR, but not *STR*. The attention being directed toward SOR/STR debates is "monumental" (Grote-Garcia & Ortlieb, 2023, p. 5); however, there remains a lack of clarity on what teaching practices and methods logically follow from the broad research base within the umbrella of SOR, particularly given disagreements on what constitutes research evidence (Lammert et al., 2022). These challenges are especially important to consider as states write standards for the preparation of reading teachers, which are separate from the standards for teaching reading content.

Prior standards initiatives have typically focused on content standards. For example, the Common Core State Standards (CCSS) dictate what should be taught and how complex texts should be introduced at each grade level, though CCSS do not prescribe specific texts that must be read. Thus, these standards permit teachers to exercise their professional knowledge (Kamil, 2016) within selective areas. Similarly, the STR standards dictate what teachers should know and be able to do to earn state certification as reading teachers. As such, it is unclear how the STR standards translated knowledge of the act of reading development into pedagogical and assessment approaches, particularly given researcher concerns about translating research into science (Solari et al., 2020). To address this, we examined how the STR standards define 'teaching.'

Element Two: Defining Reading

Within literacy research, different models exist to define the reading process. Perhaps the most often referenced model is the Simple View of Reading (Gough & Tunmer, 1986), which examines reading processes in isolation and can serve to disentangle the underlying elements of reading acquisition. Some models, such as Scarbourough's Reading Rope (2001) and Seidenberg et al.'s Four-Part Processor Model (2020) represent cognitive perspectives on reading development, while other models explain how readers acquire word-level decoding knowledge, such as the Four Phases of Word Reading (Ehri, 2020). On the other end of the spectrum are models that consider how literacy, including reading, writing, and oral language, functions as a social practice. One such model is the Four Resources Model (Freebody & Luke, 1990), which suggests that literacy users act as code breakers, text participants, text analysts, and text users as they navigate their worlds. These models all hold value as they differ in how they represent the relationship between word reading and literacy writ large.

Choosing one model to define the STR standards is challenging since each model describes different elements of reading acquisition and/or reading processes. Further, in practice, reading and writing are often combined into a 'literacy block' in elementary reading instruction. Applied research on classroom practice shows that reading and writing are integrated processes best learned together (Graham & Hebert, 2011; Philippakos & Graham, 2022) and prior studies suggest that literacy demands vary depending on the discipline and field in which they are used (Shanahan et al., 2011). This integrative aspect of literacy does not render reading-only models useless, but suggests that in the reality of elementary classrooms, teachers may require additional knowledge to effectively teach both writing and reading. Accordingly, another aim of this study was to examine the model(s) of reading and/or literacy with which the STR standards are aligned.

Element Three: Defining Learners

Finally, when reading research indicates which instructional practices are effective for readers too often there is an implied emphasis on what is effective for developmentally able, English-speaking, monolingual readers. Oftentimes, practices that are effective for most children fail to be equally effective when translated for readers with different backgrounds and identities, such as Emergent Bilinguals or students with reading disabilities (Christ et al., 2018; Snow et al., 2002). In addition, English is a uniquely challenging language to learn given that its quasi-orthographic nature (Share, 2021). Thus, the question of whether individual learners' needs will be met by the practices presented in Texas' STR is essential to consider since Texas is a highly racially, culturally, and linguistically diverse state. The 2020 census showed that during the decade 2010- 2020, Texas gained nearly 11 Latinx residents for every additional white resident, and Houston, Texas, is the most ethnically diverse city in the U.S. (Ura, 2022). In this context, understanding how individual differences and strengths are represented within Texas' STR is essential for the equitable application of the STR to practice. Flowing from these three elements, our research question is as follows: Within Texas' STR standards, how are 'teaching' 'reading' and 'learners' articulated, and what is the relationship between these elements?

Methods

Our overarching methodology was a complexity theory-informed content analysis (DeJulio et al., 2021; Gear et al., 2018; Schreier, 2012) of Texas STR standards documents. When conducting a content analysis, the aim is to honor a document's complexity by seeing "words and texts as viable data sources deserving of analysis," including messages "both standard and hidden" (Thomas & Dyches, 2019, p. 605). Complexity theory (Cochran-Smith et al., 2014) allowed us to consider the interrelatedness of different elements of the STR standards. As we utilized traditional content analysis processes such as documenting which word(s) and phrase(s) were most common, complexity theory also allowed us to critique the architecture of the standards document on the level of headings, subheadings, the examples provided, and the order in which information was presented. Thus, to explain the analytic process we followed, we provide an in-depth description of the data source.

Data Source

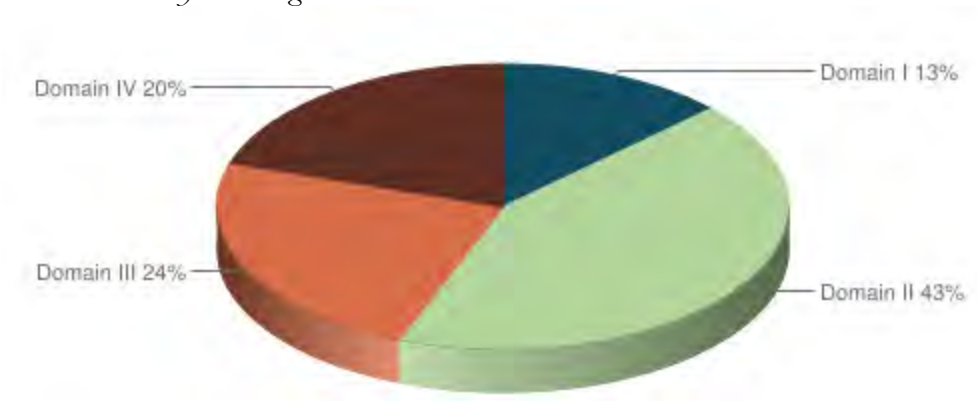
We included the full Texas STR standards approved in 2020 as our data source. The STR standards are organized into Domains and Competencies, with further clarification provided through descriptive statements referred to as Descriptors. There are 4 Domains, 13 Competencies, and 147 Descriptors delineating expectations for teaching reading. The full text can be accessed through the TEA website (2024).

Domains

Domains reference the areas of Reading Pedagogy (Domain I [D.I]), Reading Development: Foundational Skills (Domain II [D.II]), Reading Development: Comprehension (Domain III [D.III]), and Analysis and Response (Domain IV [D.IV]). Each domain represents different percentages of the standards. The two largest sections are D.II and D.II, which combined account for 67% of the standards (Figure 1).

Figure 1

STR Domains by Percentage



Competencies

Competencies (C) provide greater detail on each Domain and contain the specific topics underpinning reading pedagogy and development that teachers must master. The 4 Domains contain 13 Competencies which include: foundations of the science of teaching reading (C.1), foundations of reading assessment (C.2), oral language foundations of reading (C.3), phonological and phonemic awareness (C.4), print concepts and alphabet knowledge (C.5), phonics and other word identification (C.6), syllabication and morphemic analysis (C.7), reading fluency (C.8), vocabulary development (C.9), comprehension development (C.10), comprehension of literary texts (C.11), comprehension of informational texts (C.12), and analysis and response (C.13).

Descriptors

Descriptors provide greater specificity on these topics and comprise the bulk of the STR standards. A total of 147 Descriptors delineate the expectations on the components mentioned above of

reading, instruction, assessment, and standards-based learning that comprise reading instruction as defined by the state of Texas.

Data Analysis

Our first round of inductive coding (Saldaña, 2013) focused on five a priori codes based on our research questions and informed by complexity theory (Creswell, 2013). We recognized that the STR would, by nature, represent reading, instruction, and learners. Since policymakers presented the standards as a solution to low reading achievement in the state, we also included codes for 'reading assessment' and 'reading difficulties'. In total, the five *a priori* codes applied were: (A) Foundational Knowledge of Reading, including Domains, divisions of skills, and knowledge of reading; (B) Instruction, including pedagogies and methods of teaching; (C) Reading Assessment, including formative and summative assessments and descriptions of how they inform teaching; (D) Reading Difficulties, including characteristics of readers needing intervention; (E) The Learner including sociocultural and cognitive considerations of individuals. Coding examples are provided in Appendix A.

To maintain systematicity, both researchers identified an example of each code and discussed them with one another. After this initial agreement, we separately applied these five codes to the entire corpus of STR standards. Consistent with content analysis procedures (DeJulio et al., 2021), we included the entire document and unitized the text at the level of Descriptors (n = 147). However, we adapted traditional content analysis procedures (e.g., Schreier, 2013) by permitting the same descriptors to be coded in multiple categories. Informed by complexity theory, we determined that coding Descriptors into multiple categories allowed us to maintain a sense of the connections between the elements we were exploring (i.e., teaching, reading, and learners) while also providing us with information about the overall saliency of terms and content within the standards. Neither researcher encountered any Descriptors that could not be coded into at least one of the five a priori codes. As other researchers who have used content analysis procedures have noted (e.g., Suico et al., 2023), we found that many of the Descriptors included information that deviated from the categories assigned in the STR standards. For example, some of the Descriptors within C.2, which is focused on reading assessment, also included information on what a teacher could do with assessment results, which was tied to instruction.

Next, we determined the level of reliability of coding between coders. In this analysis, our initial coding process achieved 93.2% Interrater Reliability after first-round coding was conducted separately, and we achieved 97.5% Interrater Reliability after resolving disagreements through discussion.

Moving from first-round codes, we conducted a second round of analytic coding with an enhanced focus on complexity theory. At this stage, we reanalyzed all the Descriptors that fell into each code, as well as their corresponding Competencies and Domains, which signaled their purpose within the document. We analyzed the Descriptors at the level of content units, which we defined as phrases that expressed complete ideas. For example, C.4.B. "Demonstrate ability to accurately interpret the results of ongoing assessments in phonological and phonemic awareness and to use the results to inform instructional planning and delivery, including differentiation strategies and interventions" was broken into two segments: (A) Demonstrate ability to accurately interpret the results of ongoing assessments in phonological and phonemic awareness; (B) use the results to inform instructional planning and delivery, including differentiation strategies and interventions.

Separately, we generated analytic memos for each code. The purpose of the memos were to summarize the overall perspective presented by the sum of the Descriptors, as well as to note organizational features of the standards within (i.e., where examples of particular assessments or content were given and where they were not) and between each code (i.e., which Competency headings came earlier or later inside the document). We also attended to the saliency of Descriptors by noting how often different elements were reflected. For example, in code C: Reading Assessment, we generated a list of 31 different assessment methods mentioned in the STR, and we noted that three (phonics inventories, informal reading inventories, and spelling inventories) were mentioned multiple times.

Each memo was between 1000 and 1500 words in length. We discussed each memo together and then discussed how the memos fit together as a holistic representation of reading instruction. In this discussion, we returned to our research questions and asked how our memos could address the three elements: teaching, reading, and the learner. Through our discussion of the memos**,** four grounded themes emerged. To ensure that the themes were truly overarching representations of the standards, we did not delineate a grounded theme unless it could be supported by at least two of the five codes.

Findings

Findings are organized around the four analytic themes. These themes are a) teaching as adherence to research-based practices, b) a stand-alone view of reading separate from writing instruction, (C) a stage-based and simple view of reading, and d) minimal attention to sociocultural factors as instructional variables.

'Teaching' as Adherence to Research-Based Practices

Table 1 shows the most common terms used within the STR to describe teaching.

Table 1

Terms used to Describe "Teaching" within the STR

Term	Frequency
Research-based	76
Best Practices	66
Explicit	19
Evidence-based	17
Systematic	5
Sequential	3

All 13 Competencies reference instruction. For each of the Competencies that describe different elements of reading foundational skills and comprehension (C.3-C.12), the standards state that teachers must provide instruction relevant to each reading skill. However, rather than describe these practices, the standards repeat identical phrases for how instruction should work regardless of the skill. For example, the STR standards repeat that teachers must "understand foundational concepts, principles, and best practices related to the development of…" (n = 10) each of the ten

competencies that describe different elements of reading foundational skills and comprehension (e.g., fluency, vocabulary, morphological analysis).

The STR describes instruction as standards-based and connects the teaching of reading with state reading standards to define the knowledge and skills in which students must become proficient. Nine of 13 competencies across 15/147 descriptors (10%) reference standards-based instruction, specifically identifying TEKS for English Language Arts and Reading (ELAR) (n = 15), PRK-G (n = 15), and Texas English Language Proficiency Standards (ELPS) for English learners (n = 1). Further 9/10 competencies (C.3-C.9, C.11-C.12) on reading components reference standards-based instruction.

Broadly, the STR standards explain that instruction should be based on state content standards (C.1.B), and content standards should inform teachers by identifying grade-level skills to be assessed (C.2.A). Additionally, competencies (C.3-C.9, C.11-C.12) on reading skills also reference standards in their initial descriptors through the phrase "as described in Texas Prekindergarten Guidelines and the TEKS for ELAR (Kindergarten through Grade 6)" Each competency repeats this phrase and links a specific reading component to state standards. Standards also reference the ELPS for English language learners primarily through C.3 Oral Language, which again described standards-based instruction as the basis for planning "appropriate language and literacy instruction for English learners" (C.3.J). As these examples demonstrate, in this framework, the STR standards inform all aspects of the instructional cycle, including assessment, instruction, and differentiation, and content standards supply the material to be taught, yet neither is fully articulated.

The percentage of Descriptors referencing research or evidence-based practices varies depending on the Competency. The highest is in C.7, Syllabication and Morphemic Analysis, where 7/10 Descriptors (70%) reference research or evidence, and in C.6, Phonics and other Word Identification, where 9/13 Descriptors (69%) reference research or evidence. In contrast, only 7/13 Descriptors (54%) mention research in C.10, Comprehension. Though STR defines instruction as evidence-based, it does not define the terms science, research, or evidence. Beyond noting key findings from the National Reading Panel and the National Literacy Panel on Language Minority Children and Youth in Competency I, no references to research are given.

Descriptors provide further explanation of instruction but often contain limited guidance on what instructional methods constitute research-based, explicit-systematic instruction for different elements of reading. Of the 147 Descriptors, only 20 (5%) provide concrete examples and a clear description of an instructional activity, and the standards do not state why these 20 Descriptors were chosen to include examples. For instance, C.8.G describes best practices for developing reading rate and automaticity to enhance fluency and comprehension. This guidance suggests teachers should engage "students whose decoding skills are not yet automatic in oral reading or whisper reading with teacher monitoring for accuracy and feedback." Here, some guidance is provided to use "oral reading or whisper reading," yet, most Descriptors do not contain examples and carry little specificity. For example, C.6 Phonics and Other Word Identification describe instruction for explicit, systematic phonics instruction as such:

> Demonstrate knowledge of research-based strategies and best practices for delivering explicit, systematic phonics instruction (e.g., short vowels in VC and CVC words; short vowels in CVCC and CCVC words, first with consonant digraphs, then with consonant blends; long-vowel words spelled with silent e [VCe and CVCe]; long-vowel words spelled

> with vowel teams [CVVC]; words with an r-controlled vowel [CVrC]; words with vowel teams that are diphthongs; words with consonant trigraphs or complex consonant clusters [CCCVC, CVCCC]). (C.6.E)

Here, the standards describe the sequence of the letter-sound correspondences the students should master (i.e., content), but they do not provide a picture of specific teaching practices to match these skills (i.e., pedagogy). Beyond stating that teachers should have "knowledge of research-based strategies and best practices," no information on what these best practices entail is provided.

In sum, according to the STR standards, teachers must rely on scientifically based instruction driven by content standards, assessment, and explicit research-based instruction. Teachers, according to this complex system of teaching reading, should follow these state standards, as evidenced in C.13 Analysis and Response, to select an "appropriate, effective instructional strategy or intervention" (C.13.F). Specifically, what those research-based strategies are is not described 95% of the time (127 Descriptors).

A Stand-alone View of Reading Separate from Writing Instruction

The standards represent a stand-alone view of reading since they give limited attention to writing. References to writing are rare in the document (n = 9), leaving little to be described about the way writing is attended to. Furthermore, the standards describe "reading" (n = 175) much more often than "literacy" (n = 14). Reading acquisition is described in one Competency as interconnected across listening, speaking, reading, writing, and thinking (C.1.C) and described to include understanding the role of language systems (C.1.Q). In addition, the standards mention that "writing samples" (n = 2) and "written responses" (n = 2) can be used as assessment data for understanding students' reading comprehension and orthographic knowledge. Besides pointing out the connection between reading and spelling, and the reciprocal nature of decoding and encoding (C.1.E), the standards did not describe writing for other purposes or audiences, ultimately prioritizing reading processes over other areas of literacy.

A Stage-based and Simple View of Reading

The STR standards describe reading acquisition as the incremental and stage-based growth of reading skills. While the notion of an isolated simple view of reading defines the underlying model of reading upon which the STR is based, stage-based models answer the question of how the STR views reading development over time. First, most Descriptors, 116/147 (79%), function to explain the components of reading and reading processes (C.3-C.12). These standards follow a Simple View of Reading (SVR; Gough & Tunmer, 1986) as evidenced by the high-level organization of Domains and Competencies as well as the content of specific Descriptors. Briefly, SVR explains reading as the product of decoding and linguistic comprehension, whereby each is separate a component of reading skill. Similarly, the STR organizes reading skills into two main categories: D.II Reading Development: Foundational Skills (C.3-C.8), and D.III Reading Development: Comprehension (C.9-C.10). D.II explains reading development in foundational skills through 6 Competencies and 70/147 Descriptors (48%), while D.III explains reading development in comprehension through 4 Competencies and 46/147 Descriptors (31%). Since the content is more heavily weighted (48% to 31%) toward reading foundational skills and reading foundational skills are listed before reading comprehension skills, these standards place a greater emphasis on foundational word-level decoding skills over vocabulary and comprehension.

Next, the STR describes reading skills as increasing in difficulty from simple to complex. Organization of Competencies reflects this systematic, sequential perspective beginning with oral language (C.3), moving through word-level, structural understandings (C.3-C.8) to word meanings (C.9), and comprehension skills (C.10-13). Across these Competencies, 83/147 Descriptors (56%) explain the incremental acquisition of skill through terms such as stages (n= 18), continuums (n= 10), levels (n= 29), and appropriately complex (n= 20). Further, literacy instruction for English learners is described as occurring in stages noted as beginning, intermediate, advanced, and high advanced (C.3.J).

Consistent with a model of reading development as progressing sequentially, the STR Competencies describe a progression of improving students' reading comprehension of "appropriately complex texts." Overall, 16/147 Descriptors (10%) describe student reading comprehension through "appropriately complex" (n= 16) texts. The standards state that texts read by students should be appropriately complex to promote comprehension (C.10.G) in both literary (C.11) and informational texts (C.12). The STR standards state that these types of texts should be used during assessments (C.10.A, C.11.A, C.12.A), read aloud (C.10.D, C.11.E, C.12.E), independent reading (C.10.D, C.10.E), reading response (C.10.D), re-reads (C.10.I), and differentiation (C.11.H, C.12.J). Additionally, the use of appropriately complex texts supports the development of background knowledge (C.10.G), meta-cognition (C.10.H), and elements of literary (C.11.F) and informational texts (C.12.G).

According to the STR standards, engagement with appropriately complex texts facilitates comprehension, and students' reading should proceed incrementally using increasingly complex texts (C.10.E). The standards emphasize using appropriately complex texts, yet, a definition of what makes a text "appropriately complex" is never provided, readaibility formulas are not mentioned, nor is any information provided on how an appropriately complex text might be chosen. The STR states that texts should be evaluated and sequenced for instruction "according to text complexity (e.g., quantitative dimensions, qualitative dimensions, reader and task variables)" (C.11.E). Likewise, appropriately complex texts should be used to promote student knowledge of literary (C.11.G) and informational texts (C.12.H) across all comprehension levels, including literal, inferential, and evaluative. These standards present reading and text selection as incremental and stage-like, yet do little to define how appropriate text complexity changes across the reading development continuum.

Minimal Attention to Sociocultural Factors as Instructional Variables

In the STR standards, 9 Competencies (C.1-C.6, C.9-C.11) across 20/147 (14%) Descriptors reference the individual and/or culture as factors that inform reading development and instruction. For example, C.1.J notes the importance of "using an assets-based approach when acquiring, analyzing, and using background information about students (e.g., familial, cultural, educational, socioeconomic, linguistic, and developmental characteristics) to inform instructional planning." This Competency, and others like it, focus on understanding how sociocultural factors contribute to reading instruction and development, however terms such as "cultural" are not defined. The STR standards do not include the terms "race," "ethnicity," "religion," or "gender."

Of the 20/147 Descriptors (14%) that focus on sociocultural knowledge, 13/147 Descriptors (9%) reference students' homes, families, and language(s) broadly, while 7/147 Descriptors (5%) specifically reference culture and/or culturally relevant instruction. Within the Descriptors that

broadly reference the individual through family and background information, the STR standards state that teachers should use asset-based approaches when using student background to inform instruction (C.1.J), understand that families provide a critical role in reading development (C.1.P) specifically in the areas of oral language (C.3.G) and vocabulary development (C.9.E). Additionally, 5/147 (3%) note the importance of English learners' home language to instruction as asset-based, foundational to second-language acquisition, and potentially containing different language elements that may require extra support. The 7/147 Descriptors (5%) that reference "culture" and/or "culturally relevant instruction" focus on articulating what instructional practices are supportive of diverse learners. One Descriptor, C.1.I, specifically provides the example that "call-and-response strategies" are "culturally responsive" but fails to state which culture(s) this practice is responsive toward, leaving the recommendation unclear. Other Descriptors referencing culture emphasize oral language development for English learners (C.3.K). Standards also state that texts should represent diverse cultures in both assessment (C.2.D) and instruction (C.10.L, C.11.E). Further, culture is noted as a factor of instruction for oral language development (C.3.D) and vocabulary instruction (C.9.E). In these Descriptors, no specific examples of instructional practice are provided. In essence, these Descriptors minimize complex sociocultural perspectives on literacy to factors of reading instruction and skill acquisition.

Discussion

This content analysis study examined how three key elements of literacy instruction— teaching, reading, and learners— are articulated inside Texas' STR standards. Drawing on our complexity theory informed analysis of the STR standard document, we uncovered that STR only thinly engages with relevant research, largely ignores the relationship between reading and writing development, is rooted in a stage-based and simple view of reading, and minimally attends to the role of sociocultural factors in reading instruction. As a result, the STR standards leave many important questions unanswered. Since the STR has the potential to define the norms of preservice teacher preparation in reading, the strengths and drawbacks of the way the STR defines 'teaching', 'reading', and 'learners' merit further discussion.

Defining Teaching

A key message in the STR standards is that the teaching of reading must be based on research-based methods. The notion that research should inform practice is far from novel or scandalous. However, these recommendations lack specificity which creates the potential for teacher educators to claim that any practice they would like to promote has some amount of evidence behind it, as has sometimes been the case (Lammert et al., 2022). Since the phrase SOR has become part of the debates around teaching reading, individuals have used it to refer to various research practices while ignoring others (Tierney & Pearson, 2024). Based on our analysis, we do not believe that the Texas STR standards will resolve this problematic status quo given their lack of references to empirical research. It is also notable that the Descriptors focused on areas such as syllabication, morphemic analysis, and phonics, include a greater proportion of references to "research-based" teaching than areas such as comprehension. Perhaps, consistent with popular media reports (e.g., Hanford, 2018), policymakers perceived that these areas of reading instruction are particularly prone to be taught in ways that deviate from evidence-based practice. However, while they seem to suggest this has occurred, the STR standards fail to provide teachers with additional guidance.

Regarding which research should be followed, the standards specifically mention the National Reading Panel Report and the National Literacy Panel on Language Minority Children and Youth, both of which synthesize many important studies. As syntheses, both documents are positioned to represent the complexity of the SOR research base. However, both reports are oriented toward experimental research and away from design methods of study (Pearson, 2016), leaving gaps in their translation to practice (Coburn & Woulfin, 2012). Further, both are dated, with the National Reading Panel Report being nearly 25 years old and failing to capture much recent research. Many questions remain on how best to teach reading. In cases where research is scant, teachers are left with little guidance and support for their own judgment-making. In this void, one possibility is that Texas teacher educators can capitalize on the ambiguity of these standards to thoughtfully and professionally incorporate research-based practices for teaching reading as they have when faced with similar mandates in the past (Worthy et al., 2018).

Defining Reading

In the STR standards, reading is synonymous with efficient and accurate decoding, and a Simple View of Reading (Gough & Tunmer, 1986) dominates. The STR standards rely heavily on incremental models that assume a sequential process of development will be able to describe every learner's journey. Reading development does occur across predictable stages for many students, and knowledge of these stages is beneficial for new teachers. Although stage models have also been critiqued for their inability to permit accelerated learning moments and their tendency to be used to hold students back from dynamic experiences (Rogoff et al., 1995), the SVR has been well substantiated in research. Thus, while the model that the STR is aligned to is sufficient for explaining word solving and decoding, it does not fully address questions of how literacy functions as a contextually embedded social practice.

Relatedly, the standards fail to capitalize on the value of combining writing and reading instruction to make both more powerful (Philippakos & Graham, 2022). It may seem unfair to issue this critique of standards that are, by their very name, focused on reading. However, through a complexity lens (Byrne, 1998) and given the urgency of increasing students' reading achievement and the benefits of integrating reading and writing instruction, it is disappointing that the STR standards function as stand-alone reading standards.

Defining the Learner

The STR standards also suggest that individual differences between learners have minimal relevance on decisions about teaching and reading, given that so few Descriptors engage with this topic. Fully 86% of the standards are silent on the relevance of sociocultural factors, and nowhere do the standards mention race, ethnicity, religion, or gender. Within the standards, sociocultural factors are sometimes described as assets, but more often, are mentioned as elements that change and/or increase the difficulty of providing appropriate reading instruction. In addition, just one example of practice that represents culturally responsive teaching is provided, and it is "call-and-response strategies." The standards fail to state which culture(s) this practice is responsive toward, which paradoxically reifies the notion that teaching lacks complexity (Byrne, 1988) and a standardized set of practices will fit all diverse learners' needs. This runs in contradiction to the very notion of culturally responsive teaching itself. As a result, the Texas STR standards have the potential to support preservice teacher education that minimally attends to the importance of sociocultural factors, if at all.

Limitations

The standards examined in this research apply only to the state of Texas. Texas has long been an influential policy state; however, the nuances between the different state standards require further analysis. In this case, by using a complexity theory perspective, we attempted to avoid a reductionist approach to content analysis that would avoid engaging with these nuances. Furthermore, understanding how the implementation of the standards varies by Education Preparation Program and how these variations impact practice falls outside the scope of this content analysis. This is important work for future study.

Conclusions

Texas STR standards are valuable in their focus on deepening teachers' knowledge of reading development and cognitive theory. The uptake of the standards has the potential to highlight the depth of knowledge achieved by well-prepared teachers of reading and the importance of teacher educators' knowledge of research on reading acquisition. However, in key places, Texas' STR poorly defines several elements of teaching reading by intimating them in overly prescriptive terms yet remaining silent on specifics. As such, the standards fall short of delivering on the promise of utilizing the newest and most compelling research evidence in the field of reading research. Some of the silences in the STR standards suggest room for professional autonomy. For example, specific assessments (e.g., Dynamic Indicators of Basic Early Literacy Skills [DIBELS]) are not mentioned, but the use of assessments that correspond to these goals are described (e.g., nonsense word recognition). This could be interpreted as signaling trust in teacher educators and teachers to select assessments that fit their instructional goals and contexts. However, given the lack of connection to relevant research, the lack of specificity, the utilization of reductionist models of literacy acquisition, and the avoidance of meaningfully discussing writing, the STR standards have far to go to reflect the complexity of the professional knowledge needed to effectively teach all children to read.

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