TEACHER KNOWLEDGE MATTERS

by

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To my husband Dwayne, and my children, Miranda and Lucas

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PREFACE

In this manuscript style dissertation, two versions of the DigiLit Framework manuscript are presented; the original version submitted to *The Reading Teacher* on March 27, 2017 is presented in Chapter 2. The final version of the DigiLit Framework that was published online in *The Reading Teacher* in November 2017 and in print in the May/June 2018 edition is presented in Chapter 3 (Baxa & Christ, 2017). In addition, the manuscript, Demystifying IRI Comprehension Data: How are Classroom Teachers Using It? submitted to *Literacy Research and Instruction* is presented in Chapter 4.

ABSTRACT

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The DIGILIT FRAMEWORK

Selecting and integrating the use of digital texts or tools in literacy lessons are complex tasks. The DigiLit Framework provides a succinct model to guide planning, reflection, coaching, and formative evaluation of teachers' successful digital text or tool selection and integration for literacy lessons. For digital text or tool selection, teachers need to consider content accuracy, quality for supporting literacy development, intuitiveness, and user interactivity. For integrating these in instruction, modeling and guided practice should be provided for both literacy skills/strategies and the use of digital text or tool affordances. Also, instruction should capitalize on the digital affordances to transform instruction beyond what is possible with paper and pencil texts or tools. Examples of using the DigiLit Framework to evaluate digital text and tool selections and their integration in literacy instruction are provided.

DEMYSTIFYING IRI COMPREHENSION DATA: HOW ARE CLASSROOM TEACHERS USING IT?

This study examined the classroom practices of nine teachers as they collected, scored, identified comprehension objectives, and used data from informal reading inventories (IRIs) to inform comprehension instruction with 23 students. Using open coding and constant comparative analysis (Corbin & Strauss, 2015), video recorded IRI administrations, post-IRI interviews, follow-up reading lessons, final interviews, and 440 pages of artifacts were analyzed. Data were analyzed for patterns of collection, scoring, comprehension objective identification, and follow-up instruction both within teachers and across teachers. Findings revealed that teachers showed strengths in administering suggested prompts, gaining additional information by asking open-ended questions, completely scoring comprehension sections, and scoring many sections completely accurately. Teachers' needs were especially evident in the accurate identification of comprehension objectives for upcoming instruction based on IRI data and in how to provide appropriate follow-up instruction based on data from an IRI. Implications include the need to explore individualized professional development given that different teachers had differing strengths and needs as they used IRIs to collect, score, inform objectives and teach comprehension lessons.

TABLE OF CONTENTS

TABLE OF CONTENTS—Continued

TABLE OF CONTENTS—Continued

TABLE OF CONTENTS—Continued

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES—Continued

LIST OF ABBREVIATIONS

TPACK	Technological Pedagogical and Content Knowledge
PCK	Pedagogical Content Knowledge
SAMR	Substitution, Augmentation, Modification, Redefinition
IRI	Informal Reading Inventory
Ph.D.	Doctor of Philosophy
MAT	Master of Arts in Teaching
BAS	Benchmark Assessment System
DRA2	Developmental Reading Assessment 2nd Edition

CHAPTER ONE

TEACHERS' KNOWLEDGE MATTERS

My research agenda focuses on helping teachers build their knowledge to improve literacy instruction. The papers in this dissertation represent examples of this agenda, which are interrelated by (a) sharing similar teacher knowledge lenses, (b) focusing on teacher knowledge enacted prior to literacy instruction, and (c) focusing on teacher knowledge enacted during literacy instruction.

Teacher Knowledge Lenses

Teacher knowledge in this dissertation is investigated through the lens of the Pedagogical Content Knowledge framework (PCK; Shulman, 1986,1987). Further, the lens of the Technological Pedagogical and Content Knowledge framework (TPACK), which builds on Shulman's original work, is applied to instruction that includes digital texts or tools (Mishra & Kohler, 2006; Shulman, 1986,1987).

Teacher Knowledge Enacted Prior To Instruction

One aspect of teacher knowledge enacted prior to instruction that I investigated in my first dissertation manuscript, The DigiLit Framework, focused on how well teachers selected digital texts or tools for literacy instruction (Baxa & Christ, 2017). This is important because research shows that teachers have difficulty with selecting digital texts and tools for literacy instruction (Israelson, 2014; Zoch, Belcher, & Meyers, 2016). To capture gradations of knowledge that reflected how well teachers made these selections, I co-created the DigiLit Framework, which presents four criteria for digital text or tool selection: literacy content accuracy, digital text or tool quality for supporting literacy

development, intuitiveness of the digital text or tool navigation, and user interactivity (Baxa & Christ 2017). The DigiLit Framework might be used to guide teachers' effective selection of digital texts or tools to use in literacy instruction and to improve teacher knowledge over time.

Likewise, my second dissertation manuscript, Demystifying IRI Comprehension Data: How Are Classroom Teachers Using It? investigated another aspect of teacher knowledge enacted prior to literacy instruction—teachers' IRI comprehension collection and scoring. Understanding teachers' knowledge regarding IRI collection and scoring for the purpose of gathering data to inform objectives for upcoming instruction and implementation of this instruction is important given that research shows 70% of teachers use informal assessments, such as IRIs (Ford & Opitz, 2008). Based on the data from my research, teachers need professional development to improve the accuracy of IRI comprehension data collection and scoring.

Teacher Knowledge Enacted During Literacy Instruction

One aspect of teacher knowledge enacted during literacy instruction that I investigated in my first dissertation manuscript was how teachers integrated digital texts or tools into instruction. This is important given that while frameworks existed to separately guide the instruction of literacy lessons and digital texts or tools there were no existing frameworks that guided the integration of digital texts or tools specifically for literacy instruction (Mishra & Koehler, 2006; Pearson & Gallagher, 1983; Puentedura, 2010). To address this I co-created criteria for the DigiLit Framework to inform aspects of digital text or tool integration in literacy instruction: model a general literacy skill or strategy, guide a student's use of a general literacy skill or strategy, model the use of a

digital-specific skill or strategy, guide the student's use of a digital-specific skill or strategy, capitalize on the affordances of digital texts or tools (Baxa & Christ, 2017). Teachers can use the DigiLit Framework to guide the integration of digital texts or tools in their literacy lessons.

Similarly, my second dissertation manuscript focused on teacher knowledge enacted during literacy instruction by coding how teachers identified comprehension instruction objectives and implemented instruction for these based on IRI comprehension data. This is important because teacher knowledge is fundamental to literacy assessment as teachers use data to learn how students are progressing, consider what kinds of instruction and support would best address students' needs, as well as choose, design, and implement pedagogies that provide instruction and support (National Council of Teachers of English, 2018). Based on the data from my research teachers could benefit from professional development regarding selecting accurate comprehension objectives and providing appropriate instruction based on those objectives.

Summary

My research agenda includes investigating teacher knowledge enacted prior to and during literacy instruction. Both manuscripts in this Manuscript Style Dissertation focus on building teacher knowledge to improve literacy instruction. Professional development in the areas identified by my research could potentially support and extend teacher pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK) to improve literacy instruction.

CHAPTER TWO

THE DIGILIT FRAMEWORK VERSION 1

Teaser Tip

Digital texts and tools are increasingly prevalent in literacy classrooms. This article presents how to plan for and evaluate the effectiveness of their selection and integration in literacy lessons.

Pause and Ponder

- What are the characteristics of effective digital text and tool selection?
- What are the elements of effective digital literacies instruction?
- What kinds of digital features are needed to support learning beyond paper and pencil affordances?

Introduction

Digital literacies involve multiple modes of information, such as sounds, animation, images, written or oral text, etc. that convey meaning, and can hail from a variety of sources such as the Internet or apps (Bawden, 2001). Since there are multiple pathways by which students might use these modes and sources to construct meaning, the meaning-making process is complex (Kress, 2010). Further, not all students simply acquire effective digital literacies practices on their own, without direct instruction (Authors, under review; de Jong & Bus, 2003; 2004; Lefever-Davis & Pearman, 2005). Thus, teachers, professional organizations, and learning standards all recognize the importance of including digital literacies in instruction (Hutchison & Reinking, 2011;

International Reading Association, 2009; National Council of Teachers of English, 2008; Common Core State Standards, 2010).

Clearly, we have been called to action—but what guides digital text or tool selections and their integrations in literacy lessons? Consider the following vignette.

> Mrs. Williams, a literacy coach, walks into a 1st grade classroom to observe a reading lesson and give feedback. As she walks in, she notices that the children are getting out their iPads and the teacher is showing the students which app they should open. She is excited to observe a lesson that uses digital technology. Digital texts and tools are being encouraged more and more by the principal and the district. However, she wonders, "What should I be looking for as evidence of a high-quality app or its integration in instruction?" She thinks to herself, "I know what to look for when the literacy lesson uses guided reading books, read alouds, big books, and poems, but how should my feedback change when the literacy lesson is using digital texts or tools?"

Based on questions such as those asked by Mrs. Williams, as well as other coaches and teachers in our partnership schools and university courses, we began investigating how to effectively guide digital texts and tool selections and their integrations in literacy lessons.

We identified several frameworks that informed these issues (Dragulanescu, 2002; Morgan, 2013; Israelson, 2015; Mishra & Koehler, 2006; Puentedura 2010), but none presented a comprehensive way to guide the planning and evaluation of selection and integration of digital texts and tools specifically for literacy instruction. Previous research documenting teachers' difficulties with selecting and integrating digital texts and tools in literacy instruction show a definite need for such a tool (e.g., Israelson, 2014;

Zoch, Belcher, & Meyers, 2016). The purpose of this article is to present the development of a framework to address this need, which we refer to as the DigiLit Framework, and examples of its application.

Foundations of the DigiLit Framework

Several researchers have suggested ideas and theories that guide aspects of digital text or tool selection and technology integration in instruction. We reviewed these to inform the development of our DigiLit Framework, which specifically guides digital text and tool selection and integration in literacy lessons. For example, the Technological Pedagogical and Content Knowledge (TPACK) Framework (Mishra & Koehler, 2006) identifies the importance of considering (1) how to choose and use technologies in the lesson (technological knowledge), (2) how to teach the subject matter (pedagogical knowledge), and (3) what skills, strategies, or content must be taught (content knowledge). This informed our DigiLit Framework broadly, by underscoring the importance of digital text or tool selection and addressing both technological and content area needs through appropriate pedagogy. In the following sections, we present other frameworks and research that further informed the digital text or tool selection and instructional integration sections of the DigiLit Framework.

What Research Tells Us About Digital Text or Tool Selection

Researchers have suggested criteria for selecting digital books, apps, and websites. For selecting digital books, criteria include developmental appropriateness, allowing for active participation, and lacking distracting features (Morgan, 2013). To evaluate apps, teachers should consider how multimodal affordances add value to the lesson beyond what could be done with paper and pencil tools, literacy content,

intuitiveness of navigation, and opportunities for user interactivity (Israelson, 2015). Criteria for website evaluation include considering the accuracy, authority, coverage, currentness, density, interactivity, objectivity, and promptness of information (Dragulanescu, 2002).

Unfortunately, it may be difficult for teachers to recall these various criteria, and for evaluators to score these selections consistently when observing lessons. Thus, as shown in Figures 2.1-2.4 (see end of chapter for figures), we synthesized previously suggested selection criteria (presented on the left sides of the figures) into just four criteria for digital text or tool selection (presented on the right sides of the figures).

The final four criteria for digital text and tool *selection* in our DigiLit Framework are the following: *Literacy content accuracy*, such as proper spelling, grammar, use of word patterns, etc. (Dragulanescu, 2002; Israelson, 2015; Morgan 2013);

1. Digital text or tool quality for supporting literacy development, including its
   - developmental appropriateness,
   - lack of distracting features,
   - value-added based on multimodal features, and
   - use of continuous text since it has been shown to be more effective for literacy instruction than excerpts or blurbs of text (Allington, 2002; Dragulanescu, 2002; Israelson, 2015; Morgan, 2013; Taylor, Pearson, Peterson, & Rodriguez, 2003);

2. Intuitiveness of the digital text or tool navigation, such as whether the student is likely to figure out how to use the app features on her own (Israelson, 2015; Morgan 2013); and

3. User interactivity, particularly in terms of opportunities to use features to interact with the app to promote active learning (Dragulanescu, 2002; Israelson, 2015; Morgan, 2013).

What Research Tells Us About Instructional Integration

We did not find any existing frameworks that specifically guide the integration of digital texts and tools *for literacy instruction*. However, three frameworks guided our development of such a framework: The Gradual Release of Responsibility Model (Pearson & Gallagher, 1983), The TPACK Framework (Mishra & Koehler, 2006), and the Substitution, Augmentation, Modification, and Redefinition (SAMR) Framework (Puentedura, 2010).

The initial two phases of the Gradual Release of Responsibility Model, *modeling* and *guided practice*, are explicitly represented in our DigiLit Framework (Pearson & Gallagher, 1983). These two methods, and their use along a graduated continuum until a student can engage in the skill or strategy independently, are staples in most experienced literacy teachers' repertoires (Pearson & Gallagher, 1983; Allington, 2002; Duke & Pearson, 2008; Rupley, Blair, & Nichols, 2009). They are just as important in digital literacy lessons as they are in non-digital lessons.

Further, the TPACK Framework (Mishra & Koehler, 2006) underscores the importance of considering how both content and technology are addressed by pedagogy in evaluating digital literacies integration. Therefore, it guides us to consider the importance of pedagogical practices, such as modeling and guided practice, for both general literacy skills or strategies (e.g., inference or word recognition) *and* technology-specific skills or strategies (e.g., using hotspots or hyperlinks). Based on the TPACK

framework, we also recognize the often dynamic-interplay between teaching these two interrelated kinds of objectives, such as effective use of digital affordances to support general literacy skill or strategy outcomes or the knowledge gained from general literacy skills or strategies that might inform the appropriate use of digital affordances (e.g., Authors, in progress).

Finally, the SAMR Framework (Puentedura, 2010) guided our design of levels of the quality of digital text or tool integration in literacy lessons. The SAMR Framework suggests gradations of increasingly more effective technology integration as follows.

- Substitution does not improve the lesson beyond what could have been accomplished with paper and pencil. It is the lowest-quality integration.
- Augmentation provides some additional content that enhances the user's experience over that of paper and pencil methods, such as adding sound or animation, but does not support better processing as compared to paper and pencil tools.
- Modification reflects significant task redesign. It allows the user to do more than would be possible with paper and pencil texts or tools, such as audio recording and playing back reading of the text or multimodal composing.
- Redefinition creates a new task that can only be accomplished through the use of digital affordances. It is the highest-level integration.

Modification and redefinition levels of integration are described as transformational levels because they transform the opportunities for learning beyond what would be possible with paper pencil texts and tools. Achieving these levels should be the goals of digital integration.

Combining the ideas across these frameworks, we developed criteria specific to guide the planning or evaluation of digital text or tool integration in literacy lessons. The final criteria for the instructional integration section of the DigiLit Framework include the following.

1. Model a general literacy skill or strategy, such as making an inference (Pearson & Gallagher, 1983; TPACK Framework, Mishra & Koehler, 2006 – focusing on pedagogical and content knowledge).
2. Guide a student's use of a general literacy skill or strategy (Pearson & Gallagher, 1983; TPACK Framework, Mishra & Koehler, 2006 – focusing on pedagogical and content knowledge).
3. Model the use of a digital-specific skill or strategy to take advantage of digital affordances (Pearson & Gallagher, 1983; TPACK Framework, Mishra & Koehler, 2006 – focusing on technological and pedagogical knowledge).
4. Guide a student's use of a digital-specific skill or strategy to take advantage of digital affordances (Pearson & Gallagher, 1983; TPACK Framework, Mishra & Koehler, 2006 – focusing on technological and pedagogical knowledge).
5. Capitalize on the affordances of digital texts or tools instead of replicating affordances of paper or pencil tools. Make sure their use modifies or redefines the lesson (Puentedura, 2010; SAMR Framework).

DigiLit Framework Development and Testing

To identify gradations of performance for each of the criterion that we identified through our research reviews and syntheses for the DigiLit Framework, we asked pre-service teachers to allow us to examine their video-recorded literacy lessons that

integrated digital texts and tools. These lessons had been integrated in their field-based teaching methods courses. Twenty-eight teachers out of 30 volunteered their lessons for this purpose. Each lesson was divided into segments that focused on just one instructional objective. Fifty of these single-objective lesson segments were collected and analyzed in all.

Emergent coding and constant comparative analysis were used to identify gradations for each of the criterion in the DigiLit Framework (Corbin & Strauss, 2008). Then, we underwent iterative rounds of testing the gradations by using them to evaluate a few lesson segments at a time, and then honing the gradation descriptions for each criterion as needed to better fit the data. For example, through emergent coding we identified gradations that reflected teachers' use of modeling: (a) effective explicit modeling, (b) modeling that was unclear, (c) modeling that was incomplete, (d) incorrect modeling, and (e) no modeling.

Then, we used constant comparative method to group these meaningfully, such as combining (b) unclear and (c) incomplete modeling, which both provide potentially limited support together into one gradation (level 1). Likewise, we combined (d) incorrect and (e) no modeling, which likely provide no support into a single gradation (level 0). This process resulted in three gradations of teachers' use of modeling: level 2 - effective explicit modeling, level 1- unclear or incomplete modeling, and level 0 - incorrect or no modeling.

Likewise, we noticed that the ways that teachers capitalized on the affordances of digital texts or tools sometimes did not neatly fit within the existing SAMR Framework levels. For example, some teachers integrated digital tools that had many effective

affordances but did not use these affordances during instruction. Thus, we extended the definition of Substitution to also include the following: The technology has affordances that can be used for Augmentation, Modification, or Redefinition, but these features were not used at all, so the text/tool is used in a way that is substitution.

We continued this iterative design, application, and redesign process until the definitions for the gradations of each DigiLit Framework criterion consistently fit the data. Figures 2.5 and 2.6 present the digital text or tool selection and instructional integration sections of the final DigiLit framework, respectively. These present gradations of performance for each criterion that should be attended to when teachers plan for or evaluate their digital texts and tools selection and integration in literacy instruction.

Applying the DigiLit Framework

The DigiLit Framework can be used for a variety of purposes. Teachers can use the DigiLit Framework to help ensure that they attend to all the important aspects of selecting digital texts and tools and integrating them effectively in literacy instruction. Principals, literacy coaches, and professors can use the DigiLit Framework for formative evaluation purposes to identify and provide feedback on performance related to specific criterion, provide professional development for areas of selection or integration that seem difficult for teachers, and to track gradational improvements across these criteria over time. Finally, the DigiLit Framework can be used as a tool to guide self-reflection or collaborative reflections with peers on digital literacy lessons, such as might occur as part of a professional learning community or lesson study group.

To illustrate how the DigiLit Framework can be applied to evaluate lessons, we present four lesson vignettes from the preservice teachers who shared their lessons with us. It is important to note that these teachers had selected and integrated digital literacies in their lessons with minimal guidance, which explains why some of their uses were less than optimally effective. However, this allows us to show a meaningful sample of the gradations of practice across the DigiLit Framework. In each example below, we describe the digital text or tool, instructional integration, and how each of these areas would be scored across the criteria on the DigiLit Framework.

Word Sorts Using a Web-Based Game

Ms. Adrienne taught her student Nancy to sort words with the same beginning sounds using a web-based game, *Clifford, The Big Red Dog*, Sound Match (http://teacher.scholastic.com/clifford1/flash/phonics/). The digital game had accurate literacy content. This reflected a score of 2 on the DigiLit Framework (see Figure 2.7). However, Ms. Adrienne had to model how to use the game. This meant it was only somewhat intuitive, which reflected a score of 1 on the DigiLit Framework. The game was moderately interactive, because content could not be changed or manipulated, which reflected a score of 1 as well.

During the lesson, Ms. Adrienne explained to Nancy that the objective was to find words that started with the same sound as the word in the box. Ms. Adrienne modeled how to do this by saying, "If this is a *can* (pointing to the picture in the box on the laptop screen) we want something that starts with a /c/ sound. So, 'cat*'* starts with a /c/ sound, so I'm going to grab it and drag it into the box." This was effective modeling of both a general literacy skill (sound sorting) and digital-specific skill (grab and drop). So, Ms.

Adrienne scored 2's for both modeling a general literacy skill and modeling a digital-specific skill on the DigiLit Framework (see Figure 2.8).

Next, Ms. Adrienne guided Nancy to use the same skills. She prompted, "So, let's find other things that start with a /c/ sound." Ms. Adrienne repeated the target sound as Nancy looked. Nancy pointed to the coat, clicked on it, and dragged it into the box. The web-based game read, "coat." This effective guided practice for sorting the sound reflected a score of 2 on the DigiLit Framework. Further, since Nancy could drag and drop without needing any further support, Ms. Adrienne scored 2 for guiding the digital-specific skill as well.

This web-based game capitalized on digital affordances that modified the task as compared to a similar paper and pencil activity, because it read the words when students clicked on them. By being able to hear the words, the student could listen to the initial sound, thus supporting the sorting process in a way that a paper and pencil sort could not. This reflected a score of 2 for capitalizing on digital affordances and reflected transformative integration of a digital tool.

Chunking Multisyllabic Words with a Puzzle App

Ms. Heidi taught her student Sally to identify multisyllabic words using an app, named Multisyllabic, which showed a puzzle cut into two pieces with a part of the word on each piece. The app read each chunk of the word as the puzzle piece slid away to reveal a portion of a picture that represented the word. The app then read the entire word. This app reflected a score of 2 on the DigiLit Framework for accuracy of literacy content, as all words were spelled and chunked correctly by syllables (see Figure 2.9). It also

scored a 2 for quality for supporting literacy development. The multimodal presentation of the printed word, the reading aloud of the word, and the picture representing the word all supported word recognition. Sally showed that she intuitively knew to touch the parts of the word to get the app to read the chunks and then read the entire word to her, so the app's intuitiveness scored a 2. The app allowed for some interactivity (i.e., pressing word parts), but since Sally could not alter the content, it scored a 1 for being only moderately interactive.

Ms. Heidi began the lesson by showing Sally the word *toucan* on the app. She asked if Sally knew how to read the word. Sally shook her head signifying that she could not read it. Then, before Ms. Heidi had an opportunity to model how to activate the digital features or use two chunks together to identify a word, Sally immediately pressed the first chunk of the word in the iPad screen. The app read, "to". Then, Sally pressed the ending chunk of the word and the app read, "can." Sally shouted, "toucan!" Then, she pressed the word on the screen, and it read, "toucan". Sally knew she was correct.

Given the high-level of intuitiveness and support for word recognition, Ms. Heidi did not need to model or provide guided practice for either the general literacy strategy (chunking for word recognition) or the digital-specific skill (touching to activate hotspots that read the word chunks). She still scored 2's for modeling and guided practice for both teaching the general literacy strategy and digital-specific skill because Sally interrupted the modeling and did not need guided practice (see Figure 2.10).

This app provided support beyond the affordances of paper and pencil activities, such as reading each chunk of the word aloud, presenting a picture as a clue to the word, and reading the whole word to allow the student to check her accuracy. None of these

supports is available in paper and pencil versions of text, so this tool modified the lesson in a way that transformed the task. Thus, it scored a 2 on of the DigiLit Framework.

Making Text-to-Self Connections with a Web-Based Story

Ms. Connie read a web-based story with her student Jose. It was entitled, Carlos and his Teacher (https://www.raz-kids.com/main/BookDetail/id/914/from/quizroom/languageId/1). The literacy content, such as spelling, grammar, and punctuation were accurate, reflecting a score of 2 (see Figure 2.11). Since the content could not be changed or modified, the interactivity was only moderate, a score of 1. It reflected a score of 2 for intuitiveness, because there are tabs that allow the user to choose "English" or "Spanish" texts and arrows to prompt the reader to click to turn the page. The story was authentic, included continuous text, and the website allowed the user to hear the story read aloud in both English and Spanish, which could support a student in ways beyond what would be possible with a paper text. Thus, the quality for supporting literacy development was high, a score of 2. This feature was particularly appropriate for Jose. His native language was Spanish, and he was learning English as a second language.

The objective of Ms. Connie's lesson was that Jose would make a personal connection to the text after reading the story. Ms. Connie began her instruction by trying to lead Jose toward making a connection, rather than modeling how to make one. This reflected a score of 1 for modeling a general literacy strategy (see Figure 2.12). She began by asking Jose about his teacher, "What do you guys do together?" Jose told her, "We do journal." Then, Ms. Connie suggested a connection, "You and Carlos are both

similar because you both go to school, right?" This was ineffective because instead of guiding Jose to develop a connection she provided one for him. Worse, the connection she suggested had nothing to do with the information Jose had shared with her about his experience. Given the lack of guidance offered to Jose, Ms. Connie scored a 0 for guiding her student's engagement with making a connection.

Throughout the lesson, Ms. Connie never modeled or guided the use of the digital affordances in the web-book (reading aloud in English and Spanish). Therefore, she scored 0 for both modeling and guided practice of digital-specific strategies. This resulted in Jose never accessing the Spanish version of the story, which might have facilitated his comprehension and ability to make a connection.

While the text had appropriate affordances to potentially support Jose's reading, Ms. Connie did not capitalize on these affordances, as she never used them or helped Jose use them. Thus, she scored a 0 since the task was essentially the same as a paper and pencil version of the text without use of the affordances.

Story Elements with a Digital Text

In the final lesson example, Ms. Maddie read a digital version of the book *Ratatouille* to her student Charlie. The digital text reflected a score of 2 for literacy content, as the grammar, spelling and punctuation were all presented appropriately in the text (see Figure 2.13). While the text was an authentic and continuous, it was simply a PDF version of the book with only one digital feature – a green arrow button for turning the page. Thus, it was essentially the same as a paper text except that it was presented on a screen. Therefore, the digital text quality score was a 0. The digital text scored a 2 for intuitiveness, as the green arrow made it obvious how to turn the page. Given that page

turning was the only opportunity to interact with the book, opportunities for interactivity were low. Further, given that Ms. Maddie turned the pages herself as she read the book to Charlie, he had no opportunities for interactivity. Thus, this was scored as 0.

Ms. Maddie's objective was that Charlie would be able to identify that the animals in the book were characters. After reading the story, Ms. Maddie asked Charlie, "Do you know what a character is?" When Charlie replied no, Ms. Maddie explained this to Charlie, "A character is who is in the story. So, I know this story is about the rat. So, he is a character." Ms. Maddie effectively modeled identifying a character in the story, a general literacy skill. For this she scored 2 (see Figure 2.14). As she continued to read, the character Linguine was introduced. She said, "So, here's another person in our story. So, if he's in the story he is a…" Charlie replied, "character." Ms. Maddie effectively guided Charlie's ability to recognize Linguine as a character. Thus, she scored 2 for guiding a general literacy practice as well.

Ms. Maddie did not model or guide Charlie's use of the green arrow to turn the pages of the book, its only digital feature. Thus, she scored 0 for both modeling and guided practice of digital-specific skills.

Given that there was only one digital feature, and it merely substituted the process of turning the pages of a paper book, this was a substitution-level use of digital affordances. Further, given that Charlie had no opportunity to interact with the digital text, it would have been scored as 0 for capitalizing on digital affordances anyway, even if it had better features for him to use.

Conclusion

We developed the DigiLit Framework to meet the need for a framework to guide the selection and integration of digital texts and tools in literacy lessons. While previous research informed the design of our framework, none had specifically addressed these for literacy instruction.

The DigiLit Framework provides four criteria for selecting any digital text or tool. These include considering (1) Literacy content accuracy, (2) Digital text or tool quality for supporting literacy development, (3) Intuitiveness, and (4) User Interactivity. Likewise, the framework provides five criteria for integrating digital texts and tool in literacy instruction: (1) Model a general literacy skill or strategy, (2) Guide a student's use of a general literacy skill or strategy, (3) Model the use of a digital-specific skill or strategy, (4) Guide a student's use of a digital-specific skill or strategy, and (5) Capitalize on the affordances of digital texts or tools to transform the student's learning opportunity as compared to what could be achieved with paper and pencil.

The DigiLit Framework offers gradations for each of the criterion in the rubric to show the differences between addressing the criteria well, versus not so well. These gradations of performance can be used by teachers to guide effective planning or self-evaluation of digital literacy lessons, or to reflect on these lessons with peers. It can also be used by principals, literacy coaches, and professors to evaluate or provide feedback on teachers' digital text or tool selections and integrations.

While the rubric is limited by only being tested by a convenience sample of preservice teachers, its grounding on several other well-accepted frameworks improves our confidence in its potential usability across teachers of various backgrounds. However,

this remains an open question. None the less, our hope is that the DigiLit Framework will at least provide a starting place for conversations about digital text and tool selection and integration specifically for literacy instruction.

Take Action!

1. Use the DigiLit Framework to guide your planning for digital text or tool selection and integration in literacy instruction. Select digital texts and tools that have accurate content, are good quality for supporting literacy development, are highly intuitive, and are highly interactive. Be sure to model and provide guided practice for both general literacy skills and strategies and digital-specific skills and strategies. Aim to use digital texts and tools that are transformative and offer support for learning beyond what could be achieved using paper and pencil tools.
2. Use the DigiLit framework to guide your self-reflection or collaborative reflection with peers. Video-record your digital literacy lesson and evaluate each criterion in the framework to identify your strengths and areas for improvement. Evaluate your selection of digital texts and tools, whether you modeled and provided guided practice for both general literacy skills or strategies and digital-specific skills or strategies, and how well you capitalized on the affordances of the digital texts or tool to transform your lesson beyond what could have been accomplished using paper and pencil tools.

More to Explore

- Video that provides an overview of the SAMR Model: https://www.youtube.com/watch?v=G3c0dVRzv3U

- Video that provides and overview of the TPACK Framework: https://www.youtube.com/watch?v=FagVSQlZELY
- Eight examples of lessons with technologies used at each level of the SAMR Framework: http://www.emergingedtech.com/2015/04/examples-of-transforming-lessons-through-samr/
- Examples of transformative technology integration for specific purposes: https://www.edutopia.org/blog/integrating-technology-and-literacy-frank-ward
- Read, Write, Think article with related lesson plan on iPad integration http://www.readwritethink.org/professional-development/professional-library/exploring-ipad-literacy-learning-30924.html?tab=1#tabs
- Read, Write, Think article with related strategy in practice section on a multimodal literacy tool Glogster http://www.readwritethink.org/profeional-development/strategy-guides/using-glogster-support-multimodal-30789.html

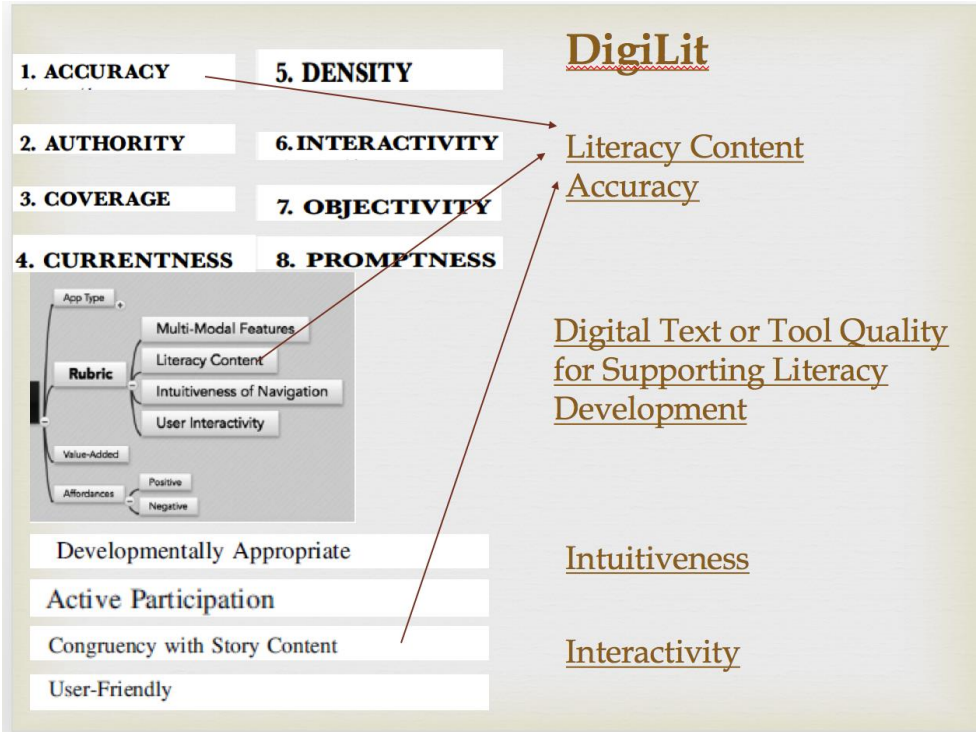


Figure 2.1 Previous Research that Informed the Criterion "Literacy Content Accuracy"

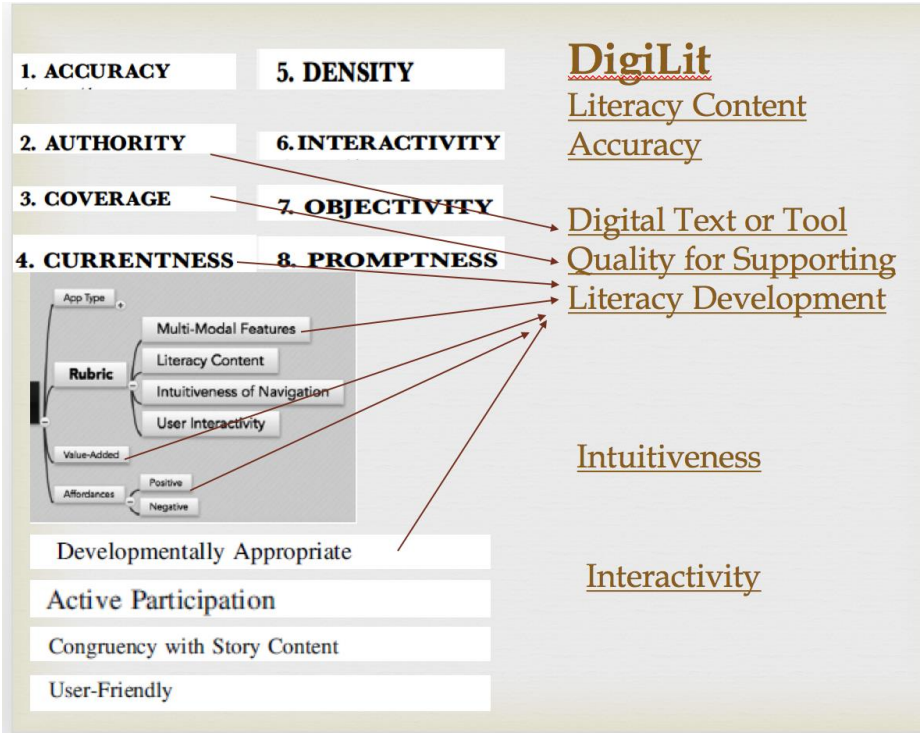


Figure 2.2. Previous Research that Informed the Criterion "Digital Text or Tool Quality"

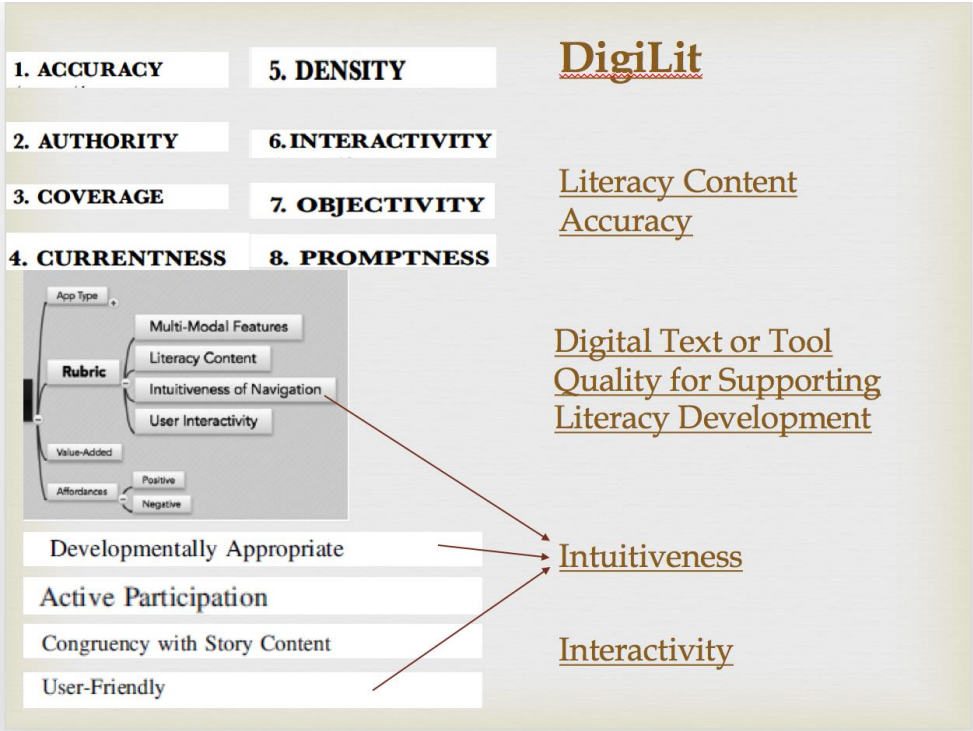


Figure 2.3. Previous Research that Informed the Criterion “Intuitiveness”

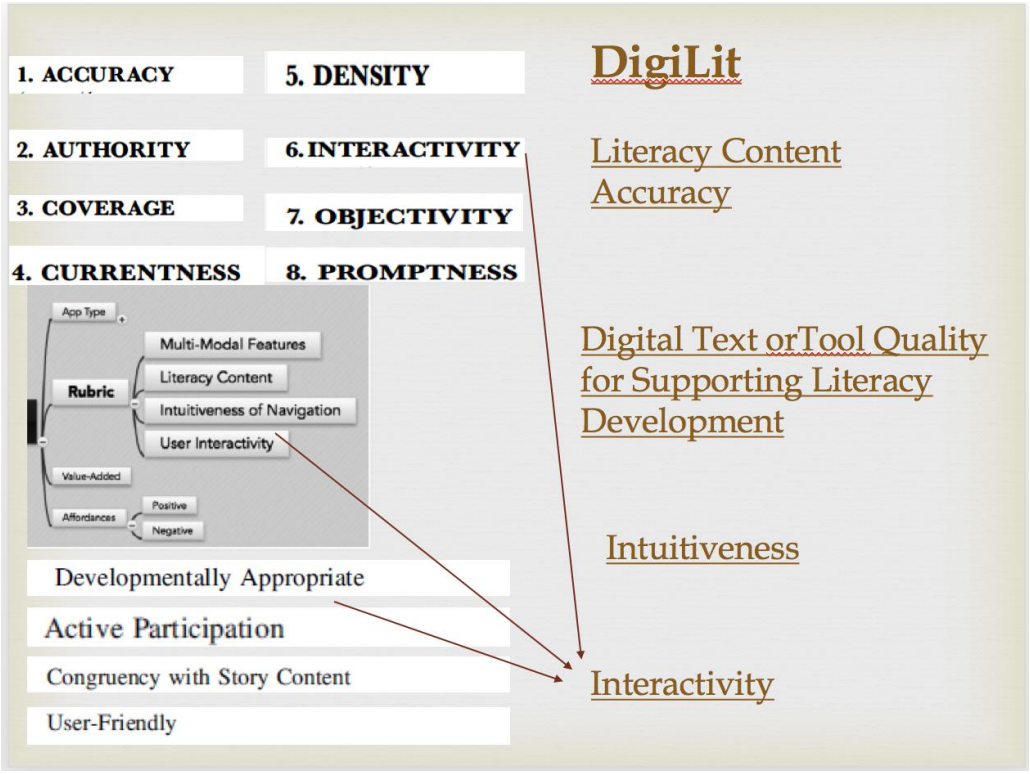


Figure 2.4. Previous Research that Informed the Criterion "Interactivity"

DigiLit Text or Tool Selection Criteria	**2**	**1**	**0**
Literacy Content Accuracy	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling)	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality for Supporting Literacy Development	Text Quality: Authentic, continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: Authentic, continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	Intuitive - Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	Somewhat Intuitive - Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features but is able to use them with guidance.)	Confusing - Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)

Figure 2.5 DigiLit Text or Tool Selection Framework

User Interactivity	High Interactivity - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	Moderately Interactivity - Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	No Interactivity - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 2.5 continued

DigiLit Integration in Literacy Instruction Criteria	**2**	**1**	**0**
Model a General Literacy Skill or Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with the General Literacy Skill or Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.
Model a Digital-Specific Skill or Strategy	Provides effective, explicit modeling of how to use the digital-specific skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the digital-specific skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with a Digital-Specific Skill or Strategy	Use of the digital-specific skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the digital-specific skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Capitalize on Digital Affordances	Modification - same literacy task but different processing than paper OR Redefinition - different literacy task and processing than paper	Augmentation - same literacy task and processing as paper with additions to content	Substitution - same literacy task and processing as paper with no additions to content, OR has affordances but these weren't used

Figure 2.6. DigiLit Integration in Literacy Instruction Framework

DigiLit Text or Tool Selection Criteria	**2**	**1**	**0**
Literacy Content Accuracy	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling)	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality for Supporting Literacy Development	Text Quality: Authentic, continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: Authentic, continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	**Intuitive -** Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	**Somewhat Intuitive -** Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features, but is able to use them with guidance.)	**Confusing -** Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)

Figure 2.7. Ms. Adrienne's DigiLit Text or Tool Selection Framework

User Interactivity	**High Interactivity** - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	**Moderately Interactivity -** Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	**No Interactivity** - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 2.7. continued

DigiLit Integration in Literacy Instruction	**2**	**1**	**0**
Model a General Literacy Skill or Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with the General Literacy Skill or Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.
Model a Digital-Specific Skill or Strategy	Provides effective, explicit modeling of how to use the digital-specific skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the digital-specific skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with a Digital-Specific Skill or Strategy	Use of the digital-specific skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the digital-specific skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Capitalize on Digital Affordances	**Modification** - same literacy *task* but *different processing* than paper OR **Redefinition** - different literacy *task* and *processing* than paper	**Augmentation** - same literacy *task* and *processing* as paper with additions to content	**Substitution** - same literacy *task* and *processing* as paper with no additions to content, OR has affordances but these *weren't used*

Figure 2.8. Ms. Adrienne's DigiLit Integration in Literacy Instruction Framework

DigiLit Text or Tool Selection Criteria	**2**	**1**	**0**
Literacy Content Accuracy	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling)	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality for Supporting Literacy Development	Text Quality: Authentic, continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: Authentic, continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	**Intuitive** - Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	**Somewhat Intuitive** - Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features, but is able to use them with guidance.)	**Confusing** - Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)

Figure 2.9. Ms. Heidi's DigiLit Text or Tool Selection Framework

User Interactivity	**High Interactivity** - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	**Moderately Interactivity -** Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	**No Interactivity** - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 2.9. continued

DigiLit Integration in Literacy Instruction	**2**	**1**	**0**
Model a General Literacy Skill or Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with the General Literacy Skill or Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.
Model a Digital-Specific Skill or Strategy	Provides effective, explicit modeling of how to use the digital-specific skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the digital-specific skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with a Digital-Specific Skill or Strategy	Use of the digital-specific skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the digital-specific skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Capitalize on Digital Affordances	Modification - same literacy task but different processing than paper OR Redefinition - different literacy task and processing than paper	Augmentation - same literacy task and processing as paper with additions to content	Substitution - same literacy task and processing as paper with no additions to content, OR has affordances but these weren't used

Figure 2.10 Ms. Heidi's DigiLit Integration in Literacy Instruction Framework

DigiLit Text or Tool Selection Criteria	**2**	**1**	**0**
Literacy Content Accuracy	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling)	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality for Supporting Literacy Development	Text Quality: Authentic, continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: Authentic, continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	Intuitive - Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	Somewhat Intuitive - Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features, but is able to use them with guidance.)	Confusing - Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)

Figure 2.11 Ms. Connie's DigiLit Text or Tool Selection Framework

User Interactivity	High Interactivity - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	Moderately Interactivity - Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	No Interactivity - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 2.11 continued

DigiLit Integration in Literacy Instruction	**2**	**1**	**0**
Model a General Literacy Skill or Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with the General Literacy Skill or Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.
Model a Digital-Specific Skill or Strategy	Provides effective, explicit modeling of how to use the digital-specific skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the digital-specific skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with a Digital-Specific Skill or Strategy	Use of the digital-specific skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the digital-specific skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Capitalize on Digital Affordances	**Modification** - same literacy *task* but *different processing* than paper OR **Redefinition** - different literacy *task* and *processing* than paper	**Augmentation** - same literacy *task* and *processing* as paper with additions to content	**Substitution** - same literacy *task* and *processing* as paper with no additions to content, OR has affordances but these *weren't used*

Figure 2.12 Ms. Connie's DigiLit Integration in Literacy Instruction Framework

DigiLit Text or Tool Selection Criteria	**2**	**1**	**0**
Literacy Content Accuracy	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling)	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality for Supporting Literacy Development	Text Quality: Authentic, continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: Authentic, continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	Intuitive - Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	Somewhat Intuitive - Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features, but is able to use them with guidance.)	Confusing - Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)

Figure 2.13 Ms. Maddie's DigiLit Text or Tool Selection Framework

User Interactivity	High Interactivity - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	Moderately Interactivity - Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	No Interactivity - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 2.13 continued

DigiLit Integration in Literacy Instruction	**2**	**1**	**0**
Model a General Literacy Skill or Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with the General Literacy Skill or Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.
Model a Digital-Specific Skill or Strategy	Provides effective, explicit modeling of how to use the digital-specific skill or strategy. OR The student interrupts the modeling to participate, and the teacher then shifts to guided practice.	Modeling does not clearly present how to engage in the digital-specific skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Guide Students' Engagement with a Digital-Specific Skill or Strategy	Use of the digital-specific skill or strategy is effectively gradually released to the student with appropriate support. OR The student can engage with the digital-specific skill or strategy immediately and there is no need for guided practice.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of modeling the digital-specific skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).
Capitalize on Digital Affordances	Modification - same literacy *task* but *different processing* than paper OR Redefinition - different literacy *task* and *processing* than paper	Augmentation - same literacy *task* and *processing* as paper with additions to content	Substitution - same literacy *task* and *processing* as paper with no additions to content, OR has affordances but these *weren't used*

Figure 2.14. Ms. Maddie's DigiLit Integration in Literacy Instruction Framework

CHAPTER THREE

THE DIGILIT FRAMEWORK

Teaser Tip

The benefits of digital text/tool integration are enhanced by thoughtful choices about selection and use. Learn how to plan for and evaluate the effectiveness of digital texts/tools in literacy lessons.

Pause and Ponder

- How can I effectively choose digital texts/tools for my students?
- How can I plan effective digital literacies instruction?
- What kinds of digital features should I look for in digital texts/tools that will support my students' learning beyond paper and pencil replacements?
- As a coach or administrator, what should I look for as I watch a literacy lesson that uses digital texts/tools? What kind of feedback and coaching can I give? How can I evaluate the literacy lesson?

Introduction

Digital literacies involve multiple modes of information which convey meaning. These modes include sounds, animations, images, written or oral text, etc. (Bawden, 2001). Making meaning can be complex since students can choose many paths as they construct meaning. (Kress, 2010). Furthermore, not all students simply acquire effective digital literacies practices on their own—many require direct instruction (de Jong & Bus, 2003; 2004; Lefever-Davis & Pearman, 2005). Teachers, professional organizations, and learning standards all recognize the importance of including digital literacies in

instruction (Hutchison & Reinking, 2011; International Reading Association, 2009; National Council of Teachers of English, 2008; Common Core State Standards, 2010).

Clearly, we have been called to action—but what guides teachers' digital text/tool selections and their integrations in literacy lessons?

This article presents the progression of Ms. Taylor's digital literacies text selection and integration in her teaching over time. We present actual examples from a real teacher's practice (all names are pseudonyms) to demonstrate how the DigiLit Framework can guide improvements in decision-making over time. In the opening vignette, we present Ms. Taylor's first attempt at a digital literacies lesson after her school began its initiative to integrate digital texts/tools in literacy lessons. Like any real practice, it shows both successes and room for growth. Ms. Taylor teaches in an urban school district where the majority of the children receive Title 1 services. In this first lesson, Ms. Taylor uses the Voice Memos app to help a small group of first grade students learn to monitor comprehension and retell the book *Tito Puente* by Monica Brown. She begins by explaining the task:

> Now what you're going to do—I'm going to show you how you can find some pieces in the reading, so you'll be able to make sense of what the book is saying. We're going to use this app –it's called Voice Memos. As we read, we're going to stop every few pages and we're going to record your voice, ok?

The children nod affirmatively. Then Ms. Taylor continues:

> Are you watching? I'm going to have you press this "start" button right here, and we're going to create a new memo. You're going to say what's important and then we're going to listen to them later, ok?

Next, she models how to do this. She reads aloud, and then pauses:

So, I think that's important, don't you – that he could make music before he could walk?

So, I'm going to record myself saying that. Are you ready? Want to watch how I do it?

One child had been resting his head on the table, but now he looks up at Ms. Taylor, nods vigorously to show he wants to watch, and watches her press "start" and begin recording her important idea.

Ms. Taylor continues reading the book aloud. When she comes across another idea that she thinks is important, she tries to guide her student Ned's use of the app to monitor comprehension. She asks Ned, "Is there another important idea?" Ned points to the page, signifying that the page is important. Ms. Taylor prompts, "What about what I read to you?" Then she rereads the page. After a brief pause, she tells him the important idea: "So, he got music lessons, right?" Ned nods in agreement. Ms. Taylor asks, "Can you say his mom got him music lessons" [into the microphone]? Then she hands him the device and says, "Press the "start" button and say it." Ned presses the button and repeats what she told him to say. Then, Ms. Taylor presses the button again to end the recording.

After they are done reading the book and recording ideas, Ms. Taylor tells the students, "Now we're going to listen to what we recorded to help us retell the story." She plays the recording of all the ideas, and the children listen attentively. Ms. Taylor then asks Ned to retell the story. Ned has difficulty, but Ms. Taylor uses the pages in the book to help him recall details and rereads some pages to him again for extra support. Eventually he retells most of the story.

Teachers, literacy coaches, and principals might all have different thoughts, reactions and questions after reading the above vignette. Teachers might wonder, Was that app a good choice? Was the integration high quality? Coaches might wonder, What kind of feedback about the app selection and digital integration would be most important to provide? Administrators might wonder, How would I meaningfully evaluate this lesson?

The DigiLit Framework that we present in this article provides answers to these questions. Such answers are important because teachers have difficulties selecting and integrating digital texts/tools in literacy instruction (e.g., Israelson, 2014; Zoch, Belcher, & Meyers, 2016). Further, while several other frameworks inform these issues, none present a comprehensive way to guide the planning, reflection, coaching, and formative evaluation of teachers' selection and integration of digital texts/tools specifically for literacy instruction (Dragulanescu, 2002; Morgan, 2013; Israelson, 2015; Mishra & Koehler, 2006; Puentedura 2010). The DigiLit Framework addresses these issues.

DigiLit Framework Development

In the following sections, we present how the DigiLit Framework is informed by other relevant frameworks. Then, we present how we designed the DigiLit criteria. Finally, we explain how we used empirical data to develop gradations for each criterion.

Relevant Frameworks

The DigiLit Framework is informed by several broader frameworks. Cope and Kalantzis's (2010) Pedagogy by Design framework highlights the process by which we can design instruction that encompasses multiliteracies: experiencing, conceptualizing, analyzing, and applying. The DigiLit Framework focuses on guiding the *analyzing* and

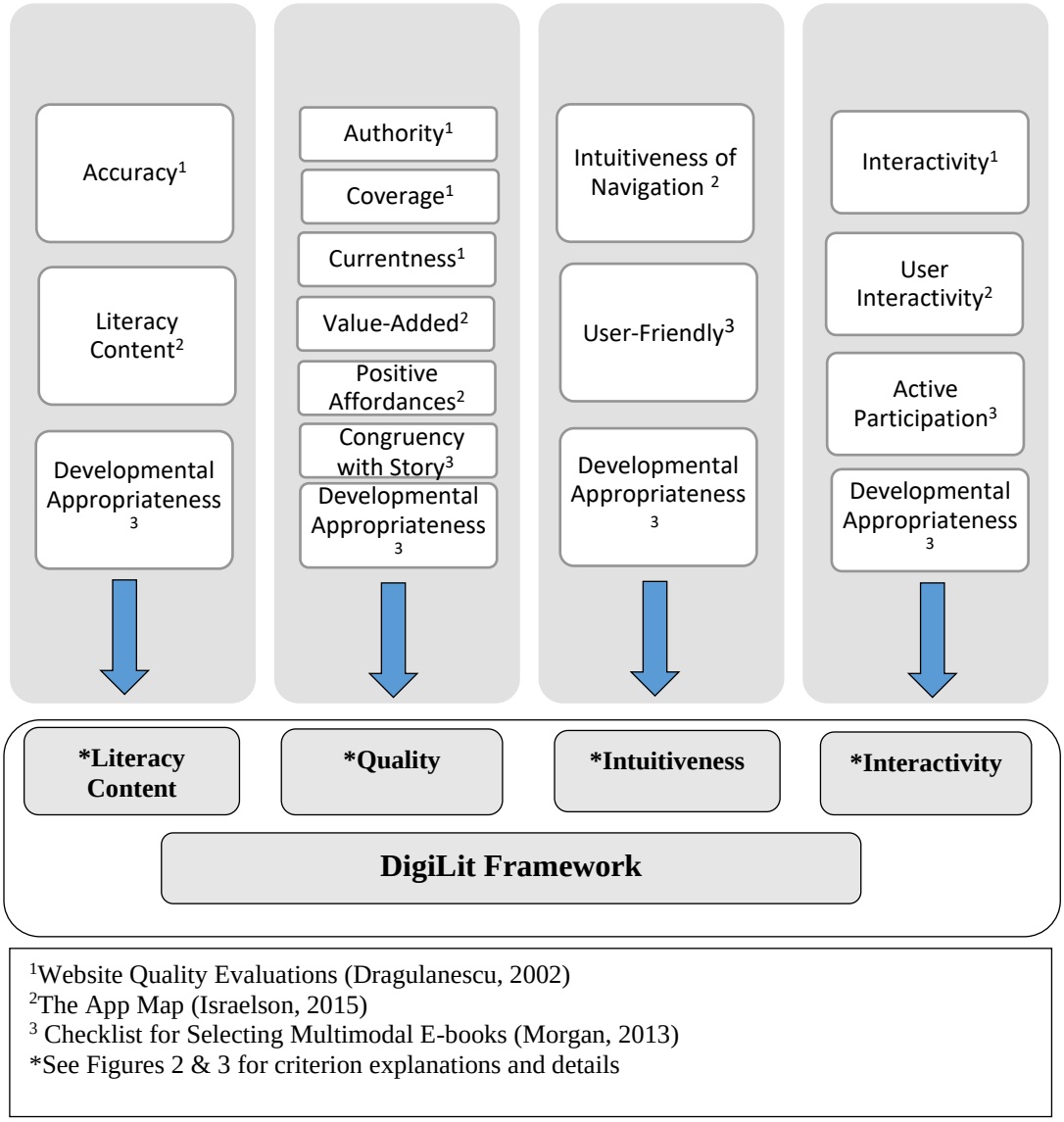
applying phases, specifically for literacy instruction. Mishra and Koehler's (2006) Technological Pedagogical and Content Knowledge (TPACK) framework underscores the importance of combining technological, pedagogical, and content knowledge. The DigiLit Framework addresses all three of these areas of knowledge across its digital literacies text/tool selection and lesson integration criteria.

Design of DigiLit Criteria

The DigiLit Framework integrates criteria suggested by other researchers in its digital text/tool selection criteria and digital literacies integration criteria.

Text/tool selection criteria. Criteria for selecting digital books, apps, and websites that were previously suggested (Dragulanescu, 2002; Israelson, 2015; Morgan, 2013) have been synthesized in the DigiLit Framework (see Figure 3.1) including using high-quality texts (Fountas & Pinnell, 2017, Roskos & Neuman, 2014). Four selection criteria resulted: literacy content, quality, intuitiveness, and interactivity (see Figure 3.2, column 1).

Digital literacies integration criteria. Criteria for integrating digital literacies in lessons were culled from best practices, such as modeling and guided practice (Pearson & Gallagher, 1983; Allington, 2002; Duke & Pearson, 2008; Rupley, Blair, & Nichols, 2009). They were also designed to address both literacy *content* and digital *technology* (Mishra & Koehler, 2006). Further, the extent to which teachers capitalize on digital affordances, based on the categories in the SAMR framework (substitution, augmentation, or modification/redefinition) is also included in the DigiLit Framework criteria (Puentedura, 2010; see Figure 3.3, column 1 for all lesson integration criteria).



[1]Website Quality Evaluations (Dragulanescu, 2002)
[2]The App Map (Israelson, 2015)
[3] Checklist for Selecting Multimodal E-books (Morgan, 2013)
*See Figures 2 & 3 for criterion explanations and details

Figure 3.1. How the DigiLit Text/Tool Selection Criteria Are Related to Previous Research

	2	1	0
Literacy Content	Provides accurate content (e.g., letters and phonemes correct; uses real words; correct spelling) **NA-** literacy content is added by the user, no original content contained	Has inaccuracies, but they do not inhibit learning	Has inaccuracies that potentially disrupt or inhibit literacy learning (e.g., incorrect phonemes, misspelled words, or incorrect informational texts)
Quality	Text Quality: High-quality (Fountas & Pinnell, 2017, Roskos & Neuman, 2014) continuous text AND has features that support processing beyond what is possible with paper texts (e.g., app books with word and animation hotspots; websites with hyperlinks, videos, etc.) Tool Quality: Digital features support processing in ways beyond what is possible with paper/pencil tools (e.g., being able to photograph pages of the texts and use these in a student-generated graphic organizer; tool has digital features that support practicing a discrete skill such as pressing chunks of words to they read aloud to support learning blending multisyllabic words)		Text Quality: High- quality (Fountas & Pinnell, 2017, Roskos & Neuman, 2014) continuous text without additional digital features (PDF book) OR Text with digital features that is not authentic/continuous (e.g., inference app) Tool Quality: Digital features do not support processing in ways beyond what is possible with paper/pencil tools (e.g., using Word to chunk multisyllabic words; using a pre-made graphic organizer on iPad) OR only provide opportunity for entertainment or game-playing unrelated to literacy learning (Chou, Block, & Jesness, 2012)
Intuitiveness	**Intuitive -** Tasks and options within digital tool clearly displayed, easily used; offers user cues (symbols, etc.) for next steps; offers illustrative example of how to use digital tool. (Student is able to engage with digital features without teacher explanation or support.)	**Somewhat Intuitive -** Generally intuitive and simple to navigate; some cues or symbols may be slightly unclear; may have a few pop-ups. (Student needs support from the teacher to understand how to use the digital features, but is able to use them with guidance.)	**Confusing -** Numerous pop-ups; unclear how to start activity once digital tool is launched/opened. (Either the teacher or student has frustration due to ongoing difficulties using the digital features.)
Interactivity	**High Interactivity** - Features will yield "energized, directed and sustained action" (Cahill & McGill-Franzen, 2013; Skinner, Kinderman, Connell & Wellborn, 2009, p.225) OR content may be changed/manipulated by user, allowing more creativity and expression (Lynch & Redpath, 2014).	**Moderately Interactivity -** Task is minimally interactive OR user cannot change or alter content (Lynch & Redpath, 2014) (e.g., simple practice of a skill like letter naming).	**No Interactivity** - No interactions are possible (e.g., child watches a video without clicking or tapping, etc.) OR the teacher controlled the technology so child never had the opportunity to interact with the digital text/tool.

Figure 3.2. Rubric for Digital Text or Tool Selection

Development of Gradations for Each Criterion

Using emergent coding and constant comparative methods (Corbin & Strauss, 2008), we analyzed 28 preservice teachers' video-recorded literacy lessons that integrated digital texts/tools. Through this analysis, we identified gradations for each criterion in the DigiLit Framework. The final gradations for each of the criterion are presented across the final three columns of Figures 3.2 and 3.3.

Applying the DigiLit Framework

The DigiLit Framework can be used for a variety of purposes. First, teachers can use the DigiLit Framework to guide their planning, including their selection of digital texts/tools and how they will integrate them into the lesson. Second, teachers can use the DigiLit Framework to guide their reflections on their lessons. Teachers can reflect on and analyze one or more aspects of the digital text/tool selection or integration after completing a lesson. Third, coaches can use DigiLit criteria, in combination with their broad knowledge of best practice for literacy instruction, to provide meaningful feedback for teachers. Finally, administrators can use the scoring of the DigiLit Framework as a formative evaluation tool to identify teachers' current strengths and potential needs for professional development. To demonstrate these uses of the DigiLit Framework, we adapted the vignettes from our sample of preservice teachers to construct the story of Ms. Taylor's journey and improvement as she began to select and integrate digital texts/tools in her classroom. The story is presented across three digital literacies lessons. Each lesson contains successes and challenges as real day-to-day teaching does. After each lesson, we describe how the DigiLit Framework was used.

	2	1	0	NA
Model a Literacy Skill/Strategy	Provides effective, explicit modeling of how to use the general literacy skill or strategy.	Modeling does not clearly present how to engage in the general literacy skill or strategy. OR Questions the student for input rather than modeling.	No evidence of modeling the general literacy skill or strategy (e.g., teacher may provide an explanation, but not an example of its application).	The student interrupts the modeling to participate, and the teacher then shifts to guided practice.
Guide Students' Use of the Literacy Skill/Strategy	Use of the general literacy skill or strategy is effectively gradually released to the student with appropriate support.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guidance for the student's engagement in the general literacy skill or strategy.	The student can engage with the general literacy skill or strategy immediately and there is no need for guided practice.
Model the Use of Digital Affordance	Provides effective, explicit modeling of how to use the digital affordances of the text/tool being used.	Modeling does not clearly present how to use the digital affordances effectively. OR Questions the student for input rather than modeling use of the affordance.	No evidence of modeling the digital affordance (e.g., teacher may provide an explanation of how to use the affordance, but doesn't show its effective use).	The student interrupts the modeling to participate, and the teacher then shifts to guided practice.
Guide Students' Use of the Digital Affordance	Use of the digital affordance is effectively gradually released to the student with appropriate support.	The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs so that it is effective.	No evidence of guiding the use of the digital affordance (e.g., teacher does not prompt or correct the student so that s/he uses the affordance effectively)	The student can engage with the digital affordance immediately, and so there is no need for guided practice.
Capitalize on Digital Affordances	**Modification** - same literacy *task* but *different processing* than paper OR **Redefinition** - different literacy *task* and *processing* than paper	**Augmentation** - same literacy *task* and *processing* as paper with additions to content	**Substitution** - same literacy *task* and *processing* as paper with no additions to content, OR has affordances but these *weren't used*	

Figure 3.3. Rubric for Digital Lesson Integration

Digital Literacy Lesson 1

As previously stated, the opening vignette presented Ms. Taylor's first digital literacies lesson after her school began its initiative to integrate digital texts/tools in literacy lessons. In the following sections, we describe how she used the DigiLit Framework to guide her planning of that lesson, and how the school's literacy coach, Ms. Adams, used the Framework to provide feedback on it.

DigiLit to guide planning. While planning for the lesson in the opening vignette, Ms. Taylor searched for apps using websites that describe, suggest, and rate learning apps, such as https://www.commonsensemedia.org or http://blog.ed.ted.com/2015/09/19/25-awesome-apps-for-teachers-recommended-by-teachers/. Then she viewed videos of apps she thought might be useful, such as Voice Memos, on YouTube (https://www.youtube.com/watch?v=uOwqXfBGYmI). Finally, she tried the app herself.

Ms. Taylor used the DigiLit criteria for digital text/tool selection as she considered her selection of the Voice Memos app (see Figure 3.2):

- Literacy content - the content would be added by the users, as they recorded ideas during the lesson.
- Quality – the features would support children's processing in ways that paper and pencil could not. In particular, Ms. Taylor recognized that by orally recording their ideas students could focus on monitoring their comprehension. Ms. Taylor removed the need to write, which she knew would be difficult for several children in her group.

- Intuitiveness – the app would be somewhat intuitive. While the red "start" button would likely signal children to press it, Ms. Taylor was unsure whether they would also figure out to press it again to stop the recording or know to press an individual memo in the string to replay them.
- Interactivity – the app allowed decisions to be made by the user about content. For example, students could record the ideas they thought would be most important thus, Ms. Taylor decided that the app would be highly interactive.

Ms. Taylor also used the DigiLit Framework criteria to guide her implementation plan (see Figure 3.3). Knowing that modeling and guided practice for both the literacy strategies and use of digital affordances were important, Ms. Taylor decided to model retelling the beginning of the story and how to start and stop the recording on the app. This was particularly important given that the app was somewhat intuitive. Had it been very intuitive, then modeling might have been less critical. (Note that the DigiLit Framework uses "NA" for not applicable when modeling is not needed because the app is sufficiently intuitive.) She also planned to provide guided practice until the children could use the skills independently. Ms. Taylor felt that her use of the Voice Memos app would capitalize on digital affordances. Students would record their voices which modified the lesson beyond what could be accomplished using pencil and paper tools. By using the audio recording feature, Ms. Taylor reduced the focus on writing, which helped students concentrate on learning to monitor their comprehension. See Figure 3.4, column 2 for a summary of Ms. Taylor's planning using the DigiLit Framework.

DigitLit to guide coaching. While Ms. Taylor taught the lesson, the literacy coach, Ms. Adams, observed and video-recorded the lesson. As Ms. Adams watched, she noted

that the Voice Memos app was high quality and highly interactive and observed as students recorded their ideas of what was important about the story. She circled "2" for both of these categories on the DigiLit Framework. She also circled "2" for modification because the Voice Memos app allowed Ms. Taylor's students to use features that would not have been allowed by a paper/pencil organizer. As Ms. Adams continued to watch she circled "NA" for literacy content because the teacher and students added all of the content. She also circled "1" for intuitiveness because Ms. Taylor needed to model how to use several features of the digital tool so that the children could use them.

Later, Ms. Taylor met with Ms. Adams. Ms. Adams began by asking Ms. Taylor how she thought the lesson went. Ms. Taylor was unsure that the Voice Memos app helped the students retell the story. Ms. Taylor fast-forwarded the lesson video to where Ned needed Ms. Taylor to reread portions of the text to retell the story. As they watched together, Ms. Taylor expressed that while the Voice Memos app reduced the frustration of writing, it did not provide a clearly organized guide for retelling important ideas. Ms. Adams agreed, but praised Ms. Taylor for her attempt to guide Ned's retelling by rereading and looking through the pictures.

Next, Ms. Adams navigated to the point in the video where Ms. Taylor asked Ned, "Is there another important idea?" and Ned responded by pointing to the page. Ms. Adams praised Ms. Taylor for trying to reread the page, to scaffold Ned. As they continued to watch what happened next, Ms. Taylor exclaimed, "I told him the answer! I needed to wait." Ms. Adams nodded, and added, "Or you could have asked questions to help guide Ned's thinking." Ms. Taylor agreed with Ms. Adams' score of "1" on the DigiLit Framework as she attempted to guide Ned's retelling but wasn't effective in

	Planning (Voice Memos)	***Coaching*** (Voice Memos)	***Reflection with colleagues*** (*Fox in Socks*)	***Formative Evaluation*** (Popplet)
Literacy content:	(NA) Content added by users.	(NA) Content added by teachers and students.	Accurate: (2) Provided accurate literacy content.	(NA) The Popplet app did not contain any preloaded text.
Quality:	High Quality: (2) Digital features support processing in ways beyond what is possible with paper/pencil tools.	High Quality: (2) The students recorded their thoughts which would not be allowed with paper/pencil tools.	High Quality: (2) Digital features supported processing in ways beyond what is possible with paper/pencil tools.	High Quality: (2) The app provided opportunities beyond those of a paper/pencil graphic organizer.
Intuitiveness:	Somewhat Intuitive: (1) The students will need support to start, stop, and replay the recordings.	Somewhat Intuitive: (1) The students needed modeling from the teacher to start the recording.	Somewhat Intuitive: (1) Students needed support from the teacher to understand how to use the digital features.	Somewhat Intuitive: (1) Students had to be shown how to make a Popple and take a picture.
Interactivity:	High interactivity: (2) …content may be changed/manipulated by user, allowing more creativity and expression	High interactivity: (2) The children audio recorded what they deemed to be important about the story.	High interactivity: (2) The children recorded their voices as they read the story.	High Interactivity: (2) Popplet allowed students to create a graphic organizer that suited their needs.
Model a Literacy Skill/Strategy	Planned to provide effective, explicit modeling of how to retell the beginning of the story.	Score: (2) Ms. Taylor modeled the first important part of the story for the children.	Score: (0) Ms. Taylor meets with her colleagues and with their help realizes that she never modeled the fluency criteria.	Score: (1) Ms. Taylor did not clearly model how to determine what events were important such as characters, setting, problem, and solution.

Figure 3.4 Ms. Taylor's DigiLit Scores Summarized

Guide Students' Use of the Literacy Skill/Strategy	Planned to provide guided support as the children retell other important parts of the story.	Score: (1) Praised Ms. Taylor's attempt to guide Ned's retelling by rereading and looking through the pictures. However, Ned needed more guidance and Ms. Taylor told him the answer.	Score: (1) The teacher tries to guide the student, but the support is not appropriately adjusted to the student's needs and is not effective.	Score: (NA) Ms. Taylor asked Jose' to identify something that was important on the page, and he was able to do this without guidance from Ms. Taylor.
Model the Use of Digital Affordance	Planned to provide effective, explicit modeling of how to start, stop, and replay the recordings.	Score: (2) Praised Ms. Taylor for modeling how to start the recording.	Score: (2) Ms. Taylor modeled how to use the digital affordances to play, read, and record the story in the app book.	Score: (2) Ms. Taylor modeled how to use the Popplet app, including how to start a Popple, how to add text, and how to take a photograph.
Guide Students' Use of the Digital Affordance	Planned to provide guided use of the digital features and gradually release responsibility to the students with appropriate support.	Score: (0) Prompted Ms. Taylor to ask Ned how to end the recording rather than doing it for him.	Score: (2) Use of the digital affordances was guided and then released to the student with appropriate support.	Score: (2) Ms. Taylor guided Jose's digital tool use as he added a Popple, took a photo, and added text in the Popple.
Capitalize on Digital Affordances	Score: (2) Modification Students would record their voices which modified the lesson beyond what could be accomplished using pencil and paper tools.	Score: (2) Modification Students recorded their voices which modified the lesson beyond what could be accomplished using pencil and paper tools.	Score: (2) Modification Students listened as the book read to them and the app recorded their voices which modified the lesson beyond what could be accomplished using pencil and paper tools.	Score: (2) Modification The app allowed for more diverse ways of organizing the information as compared to a paper/pencil graphic organizer.

Figure 3.4 continued

doing so. Ms. Taylor and Ms. Adams then brainstormed some questions that she could have asked.

Ms. Adams praised Ms. Taylor for modeling how to start the recording and circled "2" on modeling the digital features. Then, Ms. Adams navigated to the point when Ned recorded his voice saying, "His mom got him music lessons," and Ms. Taylor pressed the button to end the recording (not Ned). Ms. Jones then explained to Ms. Taylor that guided practice was important for both the teaching of the digital affordances and the literacy skill. She suggested that Ms. Taylor could have asked Ned, "How do you stop the recording?" Ms. Adams circled "0" on the DigiLit Framework for guiding the digital feature use.

As they finished their meeting, they set the following goals. First Ms. Taylor would consider whether the app provided the necessary structure to guide the literacy task. Second, she would work on guiding the student's participation in the strategy/skill instead of answering or doing it for him. See Figure 3.4, column 3 for a summary of Ms. Adam's coaching feedback.

Digital Literacy Lesson 2

In her second lesson, Ms. Taylor used a Dr. Seuss book app, *Fox in Socks*, to help her students develop word recognition and fluency. First, she began by explaining the app's functions:

> I'm going to have you use the "read to me" [mode]. [Presses "read to me". The first page of the app book read aloud.] I'm going to listen to how [fluently] it reads and try to match that reading. See the little hand? [This is a prompt

embedded in the app to show kids how to turn the page.] Now you're going to swipe to turn the page. [Ms. Taylor swipes and turns the page.]

Next, she showed the students how to record their reading of the text. "I'm going to press to record, okay?" [She presses record, then begins reading the text on that page.] Take it slowly, this book is dangerous! [She presses "stop" to end the recording.]

Then, she guided the students as they read and recorded their reading of the text: "Remember first we're going to let it read to us. Try to follow along and listen. [Students listen to text read aloud.] Now, tap "record". [Students tap "record" and begin reading.] Fox, socks… [Students press "stop" after reading, then "replay" to listen to their reading.]

Finally, Ms. Taylor refers to a fluency rubric that she has placed in front of each student and asks her student LaTisha, "Do you think you read one word at a time, like a robot?" LaTisha looks at the teacher with uncertainty. Then, after a long pause she says, "no." Then, moving along the criteria on the rubric Ms. Taylor asks, "Do you think you read 3-4 words at a time?" LaTisha again seems uncertain. She answers, "no?" Ms. Taylor continues, "Do you think you read the words the way the author wrote them? LaTisha repeats uncertainly, "The way the author wrote them?" Then, Ms. Taylor circles that criterion on the rubric.

DigiLit to guide reflection. During the weekly meeting with her grade-level teaching team, Ms. Taylor explained to her colleagues why she chose the Fox in Socks app.

Ms. Taylor: The Fox in Socks app has the same text as the book that we have in the classroom, however, it provides more interactivity with a "read to me" feature, hotspots, a recording feature, and additional

interactive games. It would score a "2" for being high quality and a "2" for interactivity. I knew that the children would need some help knowing how to get the app to read to them as well as how to get it to record their voices, so I began by modeling these features for the children. If I had used the paper book Fox in Socks, the children wouldn't have been able to record their voices and listen to check their fluency, thus, this is a modification level app.

Next, Ms. Taylor asked her colleagues to watch the recording of her second digital literacy lesson. Then, the following conversation ensued.

Ms. Taylor: How can I improve digital tool integration in my literacy lessons?

Ms. Engle: I hadn't thought of using the fluency rubric with digital texts, but I've used it during guided reading groups. I've always introduced the rubric first, modeled how each criterion might sound, and then guided my students to evaluate themselves using the criterion at the end.

Ms. Taylor: [Sighs] I showed them how to use the digital affordances to play, read, and record the story in the app book, but never modeled the fluency criteria!

Ms. Gills: Yes, so I think you would have gotten a "2" for modeling the digital affordances, but a "0" for modeling literacy skills. If you would have modeled the fluency criteria, then it would have been a "2" for modeling the literacy skill as well.

Ms. Engle: Also, you asked LaTisha to rate her fluency on the rubric by asking her questions, but I don't think she really understood your questions.

Modeling the criteria first would have helped LaTisha understand how to assess her own fluency.

Ms. Taylor: So, even though I attempted to guide LaTisha to self-assess her fluency, I only scored a "1" because my guidance wasn't helpful to LaTisha.

After the collaborative reflection, Ms. Engle decided that she would try using the Fox in Socks app with a group of her students as well and share her video with the group during their next meeting. Ms. Taylor decided that she would be more mindful of modeling the literacy practice when integrating digital texts/tools. Ms. Gills followed up by asking Ms. Taylor how she found the book, so that she could better find digital texts/tools herself. See Figure 3.4, column 4 for a summary of Ms. Taylor's reflection using the DigiLit Framework with her colleagues.

Digital Literacies Lesson 3

Ms. Taylor and her students used the app Popplet during a reading lesson. The goal of the lesson was to monitor comprehension while reading the book, *Mud Tacos*, by Mario Lopez and Marissa Lopez Wong and to retell the story at the end. If you are not familiar with the app Popplet, you can view a demo of how this app works on YouTube: https://youtu.be/CxLDsWHsQ1g.

First, Ms. Taylor explained the task to the students:

We're going to read a book – Mud Tacos. We're also going to use an app on the iPad, called Popplet. I'll show you how it works – it's right here-the little "p" (points to icon and opens app). What Popplet can do is take pictures, type—to help you remember your thoughts.

Second, she modeled how to identify an important story event after reading the

first page of the text aloud. She said, “I think it’s important that they found a big cardboard box.” Then, she modeled how to use (the app) Popplet to record this idea as part of the comprehension monitoring process:

> To start a Popple (i.e., a single square that will become part of the Popplet graphic organizer), we double-click (she double-clicks and opens a new Popple). (Pointing and explaining the digital affordances in Popplet) See this little square [icon] right there? That’s how you take a picture. The little “t” [icon] is how you type. This drawing [icon of a pencil] is how you draw. So, I’m going to take a picture. (Showing him) So, I’m going to aim [the iPad] over the picture and take the picture like that (presses the red button for taking the photo). Now I’m done (presses accept photo into the Popple). Now I’m going to type in there (in the Popple): “They found a cardboard box” (types), and just press this little dot right here (to accept the text in the Popple). So, that’s what you’re going to do—you’re going to be in charge of (monitoring with) the iPad.

Third, she guided the students to use Popplet to support their comprehension monitoring after she read the next page. Here is an example of her interactions with one student, Jose.

Ms. Taylor:	So, what do you think happened (of importance) on this page?”
Jose:	She didn’t like the tacos!”
Ms. Taylor:	Good job! So, do you want to take a picture of that and we can make (another) Popple with it?
Jose:	(Nods yes, and picks up the iPad to take a photo.)
Ms. Taylor:	(Helps him accept it into the Popple by reminding him where to

press.)

"Do you want to write anything?

Jose: (Looks to her for help.)

Ms. Taylor: (Smiles) That's right, make a new one (text box).

Jose: (Presses the "t" and opens a new text box and writes "hates tacos".)

Finally, at the end of the book, Ms. Taylor explained that they can use their Popplet to help them retell the story. She modeled how to do this by beginning to retell the story using her first Popple, and then asked Jose to use his next Popple to continue the retelling. She had all the students in the small group contribute to the retelling by referring back to their Popples.

DigiLit to guide formative evaluation. After this third lesson, Ms. Jones, the principal, used the DigiLit Framework (see Figures 3.2- 3.3) to evaluate Ms. Taylor's digital text/tool selection and lesson integration. Here is a brief summary of her analysis:

- Literacy content: The Popplet app did not contain any preloaded text, thus she scored this "NA" (not applicable).
- Quality: Students captured and uploaded story-related photographs, drew pictures, added text, and changed the size of the Popples to add as many details about an event as they found important, so she scored this a "2" because it provided opportunities beyond those of a paper/pencil graphic organizer.
- Intuitiveness: Students had to be shown how to make a Popple and take a picture, so she gave this score of "1".

- Interactivity: Popplet was highly interactive and allowed students to create a graphic organizer that reflected their thinking rather than forcing their ideas onto a predetermined paper/pencil graphic organizer; thus, she scored this a "2".
- Modeling a literacy strategy: While Ms. Taylor told her students a part of the story that she thought was important, she did not clearly model how to determine what events were important in the story by using text structure, such as characters, setting, problem, solution, and events; thus, she scored this a "1".
- Guiding students' engagement with the literacy strategy: Ms. Taylor asked Jose' to identify something that was important on the page, and he was able to do this without guidance from Ms. Taylor; thus, she scored this "NA" (not applicable).
- Modeling the use of a digital affordance: Ms. Taylor modeled how to use the Popplet app, including how to start a Popple, how to add text, and how to take a photograph; thus, she scored this a "2".
- Guiding students' engagement with a digital affordance: Ms. Taylor guided Jose's digital tool use as he added a Popple, took a photo, and added text in the Popple; thus, she scored this a "2".
- Capitalizing on digital affordances: The Popple app allowed students to monitor their comprehension and retell the story. The app also allowed for more diverse ways of representing and organizing the information as compared to a paper/pencil graphic organizer; thus, she scored this a "2" and interpreted it as a "modification" level.

Ms. Jones provided a copy of the scored DigiLit Framework with her notes for Ms. Taylor, so that they could discuss her performance during their meeting (see Figure

3.4, column 5). Overall, Ms. Taylor's digital tool selection and integration earned 14 out of 16 points on the DigiLit Framework. Through their conversation about the scores and comments about Ms. Taylor's lesson, together they decided on two goals for Ms. Taylor. First, she would share her techniques for searching for and finding good quality apps with the other teachers at her grade level. Second, she would focus on improving her explicit modeling of literacy practices in future digital literacy lessons.

Conclusion

We developed the DigiLit Framework to meet the need for a framework to guide the selection and integration of digital texts and tools in literacy lessons. While previous research informed the design of our framework, none had specifically addressed these for literacy instruction. The DigiLit Framework provides four criteria for selecting any digital text or tool. These include considering (1) literacy content, (2) quality, (3) intuitiveness, and (4) interactivity. Likewise, the framework provides five criteria for integrating digital texts/tools in literacy instruction: (1) model a literacy skill/strategy, (2) guide a student's use of a literacy skill/strategy, (3) model the use of digital affordances, (4) guide a student's use of digital affordances, and (5) capitalize on the affordances of digital texts/tools to transform the student's learning opportunity as compared to what could be achieved with paper and pencil.

The DigiLit Framework offers gradations for each of the criterion in the rubric to show the differences between addressing the criteria well, versus not so well. These gradations of performance can be used by teachers to guide effective planning or reflection. It can also be used by literacy coaches to provide feedback on teachers' digital text/tool selections and integrations. Finally, administrators can use the DigiLit

Framework to formatively evaluate text/tool selections and digital integration lessons, and track teachers' growth over time. By identifying teachers' patterns of success, they can promote teacher-to-teacher professional development. Trends in teachers' needs for improvement could guide professional development planning.

While the rubric is tested using a limited sample, its grounding on several other well-accepted frameworks improves our confidence in its potential usability across teachers, coaches, and administrators of various backgrounds. However, this remains an open question. Our hope is that the DigiLit Framework will provide a starting place for conversations about digital text and tool selection and integration specifically for literacy instruction.

Take Action!

1. Use the DigiLit Framework to guide your planning for digital text/tool selection and integration in literacy instruction. Select digital texts/tools that have accurate content, are good quality for supporting literacy development, are highly intuitive, and are highly interactive. Be sure to model and provide guided practice for both literacy and use of digital affordances. Aim to use digital texts/tools that are transformative and offer support for learning beyond what could be achieved using paper/pencil tools.
2. Use the DigiLit framework to guide your self-reflection or collaborative reflection with peers. Video-record your digital literacy lesson and evaluate each criterion in the framework to identify your strengths and areas for improvement.
3. Use the DigiLit Framework to provide specific feedback and formative evaluation of digital text/tool selection and integration in literacy lessons.

More to Explore

- Video that provides an overview of the SAMR Model: https://www.youtube.com/watch?v=G3c0dVRzv3U
- Video that provides and overview of the TPACK Framework: https://www.youtube.com/watch?v=FagVSQlZELY
- Eight examples of lessons with technologies used at each level of the SAMR Framework: http://www.emergingedtech.com/2015/04/examples-of-transforming-lessons-through-samr/
- Examples of transformative technology integration for specific purposes: https://www.edutopia.org/blog/integrating-technology-and-literacy-frank-ward
- Read, Write, Think article with related lesson plan on iPad integration http://www.readwritethink.org/professional-development/professional-library/exploring-ipad-literacy-learning-30924.html?tab=1#tabs
- Read, Write, Think article with related strategy in practice section on a multimodal literacy tool Glogster http://www.readwritethink.org/professional-development/strategy-guides/using-glogster-support-multimodal-30789.html

CHAPTER FOUR

DEMYSTIFYING IRI COMPREHENSION DATA: HOW ARE CLASSROOM TEACHERS USING IT?

Teachers, as the primary agents of assessment information, need "considerable expertise" to assign meaning and evaluate data gained from assessments (International Reading Association [IRA] & National Council of Teachers of English [NCTE], 2010, p. 14). Teachers' use of ongoing assessments has a primary influence on students' learning (IRA & NCTE, 2010). Specifically, teacher knowledge is fundamental to literacy assessment because teachers use data to determine students' progress, consider instruction to best address students' needs, as well as choose, design, and implement pedagogies that provide instruction and support (NCTE, 2018).

Assessment-based instruction focuses on using ongoing assessment data to improve student learning (Burgin & Hughes, 2009; Duncan, 2009). It results in increased student achievement in word recognition accuracy, fluency, comprehension, and overall reading achievement (Applegate & Bucci, 2013; Diehl, Armitage, Nettles, & Peterson, 2011; Mraz et al., 2013; O'Connor et. al 2002; Ross, 2004). Due to its positive impact on student outcomes, several professional organizations recommend the use of assessment-based instruction (International Literacy Association [ILA], 2017; IRA & NCTE, 2010; NCTE, 2013). To maximize these potential positive impacts, teachers need knowledge about assessment and instruction including content (subject matter), pedagogy (methods and practices), and their intersection (Shulman, 1987). This requires "considerable expertise" (IRA & NCTE, 2010, p. 14).

Research has shown that 70% of teachers use informal assessments, such as informal reading inventories (IRIs) (Ford & Opitz, 2008). Research also provides some insights about graduate students' understanding and use of miscue analysis, identification of reading levels, and recommendations for instruction (Applegate & Bucci, 2013; Johns & L'Allier, 2003; L'Allier 2013; Roberts, 1974). However, it does not tell us how well classroom teachers (1) collect IRI data about comprehension, (2) score IRI data about comprehension, (3) identify comprehension objectives from IRI data, or (4) provide instruction for comprehension objectives. Knowing about these practices could help inform policy makers and administrators, who often organize professional development for teachers, about the kinds of professional development that might be most helpful to improve teachers' knowledge and practices.

Teachers' Pedagogical Content Knowledge

This study is guided by Shulman's (1986, 1987) Pedagogical Content Knowledge framework. Shulman (1986) defines "content knowledge" as "the amount and organization of knowledge per se in the mind of the teacher" (p. 9). Content knowledge about reading comprehension includes knowing what strategies should be used by the reader to build meaning with the text, including monitoring to facilitate retelling and using prior knowledge and text clues to make inferences, etc. (Gouldthorp, Katsipis, & Mueller, 2018; Wasik & Hinderman, 2013). Content knowledge also includes knowing how readers should use these, such as when to employ a strategy, or multiple strategies, to build meaning (Shulman, 1987). Further, teachers must have a "flexible, multifaceted comprehension [of the content]" to explain how these should be used in multiple ways across readers and multiple types of text (Shulman, 1987, p. 9).

Pedagogical knowledge includes knowledge about teaching methods, "which goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching" (Shulman, 1986, p. 9). As such, teachers should have knowledge about pedagogical methods to teach reading comprehension such as using appropriate question types and techniques. For example, teachers need to know how to ask open-ended questions to gain more information from a student (e.g., Say more about that, or Tell more), rather than closed questions that might "lead students to an answer" (Beaver, 2006; Fountas & Pinnell, 2011, p. 25).

Pedagogical content knowledge is demonstrated when teachers apply both content knowledge and pedagogical knowledge to their practice (Shulman, 1986, 1987). Pedagogical content knowledge includes "a blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (Shulman, 1987, pg. 8). For example, teachers use pedagogical content knowledge to identify students' instructional needs such as correcting confusions, building new knowledge, accessing prior knowledge, etc. based on IRI data (Paris & Hoffman, 2004; Shulman, 1987).

While research surrounding teachers' content knowledge in reading and the use of related pedagogical and pedagogical content knowledge used has been conducted, no research exists regarding teachers' use of these in regards to their IRI comprehension assessments and related assessment based instruction (Cunningham, Perry, Stanovich, & Stanovich, 2004; Griffith, Bauml, & Barksdale, 2015; Moats & Foorman, 2003; Pulliate & Ehri, 2018). This study examines teacher decisions regarding the collection, scoring,

objective identification and integration of comprehension objectives into reading lessons and makes recommendations about professional development that could be provided to increase teacher knowledge in these areas.

Prior Research Related to Teachers' Uses of IRIs

There are a limited number of studies that focused on IRI assessment and follow-up assessment-based instruction. A few research studies focused on graduate students' scoring and interpretation of miscue data from IRIs, and recommendations for follow-up instruction (Johns & L'Allier 2003; L'Allier, 2013; Roberts, 1974). Roberts (1974) found that graduate students who received both instruction and practice identifying miscues were more successful doing this on their own than those who received instruction only. However, both groups were equally able to identify the reading level of students based on the number of miscues (Roberts, 1974). Likewise, Johns and L'Allier (2003), found that graduate students who were provided instruction via lecture and participated in guided practice were able to accurately determine a student's independent, instructional, and frustration reading levels when using a summary data sheet.

L'Allier's (2013) study moved past miscues and reading levels to include comprehension. The author explored how well graduate students identified students' needs for instruction based on IRI data. She found that graduate students made about two-thirds of the recommendations that experts made regarding reading instruction. Furthermore, she found that while graduate students were "consistently accurate" in scoring students' comprehension questions only four graduate students made key recommendations regarding inferring, while seven graduate students neglected to identify needs in this area (L'Allier, 2013, pg. 303). The author recommended that additional

instruction be provided to graduate students regarding inference-based questions and follow-up recommendations. Another study conducted during a 5-week summer practicum, focused on a graduate intern who used IRI comprehension data to identify one student's comprehension needs and provide targeted follow-up instruction (Applegate & Bucci, 2013). Results showed that the "diagnostic information" gathered from an IRI guided instruction and further improved student comprehension outcomes (Applegate & Bucci, 2013, pg. 267).

Another small body of research showed the effects of researcher-teacher collaborations where IRIs were used for assessment and assessment-based instruction. Researcher-teacher teams gathered and analyzed IRIs, and sometimes other data, to identify students' needs across several aspects of reading: word recognition, fluency, comprehension, and reading level (Diehl, Armitage, Nettles, & Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013). Then, the researcher-teacher collaborators designed instruction based on the identified needs (Diehl, Armitage, Nettles, and Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013). Results showed that students' fluency skills including word recognition accuracy and automaticity; comprehension strategies such as predicting, clarifying, questioning and summarizing; as well as overall reading level increased as a result of fluency, comprehension, and decoding instruction based on IRI data (Diehl, Armitage, Nettles, and Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013).

In sum, across these studies, there is evidence that when assessment data, including comprehension responses, fluency, and word recognition accuracy rates, are analyzed with "considerable expertise" (ILA & NCTE, 2010, p. 14), student reading

outcomes improved (Diehl, Armitage, Nettles, and Peterson, 2011; Johns & L'Allier 2003; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013; Roberts, 1974). However, when graduate students lacked considerable expertise (inferential responses) students' instructional needs were often not identified (L'Allier, 2013). This underscores the need to know what kinds of IRI expertise teachers are using in their classrooms to identify potential areas for improving teachers' expertise, including the ability to identify objectives and teach to improve students' outcomes.

Need, Research Questions, and Significance

Previous studies are limited in three important ways. First, there is a need to focus on practicing teachers' actual classroom practices, as previous studies focused on graduate students during their coursework (Applegate & Bucci, 2013; Johns & L'Allier, 2003; L'Allier 2013; Roberts, 1974) and researcher-teacher teams (Diehl, Armitage, Nettles, and Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013). Second, there is a need to investigate IRI comprehension findings of multiple teachers with multiple students, as only one previous case study focused on the IRI assessment and comprehension instruction of only one student (Applegate & Bucci, 2013). Third, there is a need to focus on comprehension, since two of the three previous studies of graduate students focused only on miscue analysis and reading levels, while the third resulted in recommendations to improve graduate student instruction only for inference (Johns & L'Allier, 2003; L'Allier 2013; Roberts, 1974).

To address these gaps in the literature, the following research questions were investigated regarding elementary teachers' regular classroom practices: (1) How do teachers collect comprehension assessment data from IRIs? (2) How do teachers score

comprehension assessment data from IRIs? (3) How do teachers identify comprehension objectives based on IRI data? (4) How do teachers address comprehension objectives in their instruction?

Answers to these questions may inform policy makers and administrators of the kinds of professional development most needed to help improve classroom teachers' expertise for using IRIs for assessment and assessment-based instruction.

Methods

Settings

Data were collected in two Midwestern elementary schools (each in a separate school district) to provide for a range of teacher experience administering IRIs. Most teachers at Forest Elementary (all names are pseudonyms) had five or more years of experience. Teachers at Oak Elementary generally had less than five years of experience.

Participants

All teachers at Forest and Oak Elementary Schools were invited to participate. Nine kindergarten to 5th grade Caucasian teachers volunteered. One teacher was male. Participating teachers had 1-21 years of experience. Teacher experience including years of experience administering IRIs is detailed in Table 4.1. All participants were assigned pseudonyms. Teachers were assigned gender non-specific pseudonyms and are referred to as Teacher A, Teacher B, etc. and are referred to using the singular *they,* and its derivatives (them, their).

The nine teachers sent home parental permission forms to all their students. From those students whose parents provided permission, teachers chose one student they deemed to be at each reading level: high, moderate, and low. This was to allow for

examining teachers' IRI use across students with a range of reading proficiencies. Two teachers were not able to choose students from all three levels because they received parental permissions for students with similar reading levels. Three additional teachers received only two parental permissions slips and were able to choose students at differing levels but not able to choose a student from each level.

Twenty-six students in kindergarten through 5th grade volunteered to participate in the study. Three students were excluded because their teacher did not administer comprehension questions to them, either because no questions were available (DRA 2 Level 3) or because the oral reading was at the student's frustration level. Fourteen students were female. Nine students were identified by their teachers as high readers, seven as moderate readers, and seven as low readers. Table 4.1 presents students' pseudonyms as well as the reading level that each teacher identified for each student: high, moderate, and low.

Data Sources and Collection

An overview of the data collection process and timeline is shown in Figure 4.1. Below, each sequential step of the data collection process is presented, including relevant data sources. In all, 21 hours of video data and 440 artifacts, including 131 pages of IRI documents and 309 pages of lesson artifacts, were collected.

Step 1: IRI administration. The investigator video-recorded each teacher administering an IRI with each of the identified focal students. Data were collected during the time of the year when teachers would normally administer IRIs. At Oak Elementary School, teachers administered the Fountas and Pinnell Benchmark

Table 4.1. Teacher-Student Participants, Including Identification of High, Moderate, Low Readers

Teacher	Years of Teaching Experience	Years of Experience Administering IRIs	Grade Taught at Time of Study	High Readers Assessed and Taught	Moderate Readers Assessed and Taught	Low Readers Assessed and Taught
Teacher A	1	1	3	Amari	Sadie	Simon
Teacher B	20	4	K	None	Leah	Tyrone
Teacher C	5	1	2	None	Anabelle	None
Teacher D	17	17	5	Andrew Maria	None	Alejandro
Teacher E	18	18	4	Jennifer Jasmine	Cameron Reed	Carol
Teacher F	21	20	2	Deidre	Micah	Donovan
Teacher G	16	16	K	Kiara, Breslyn	Two Students excluded	None
Teacher H	8	8	1	None	Desmond	Alonzo
Teacher I	14	14	2	Kaya	Student excluded	Arianna

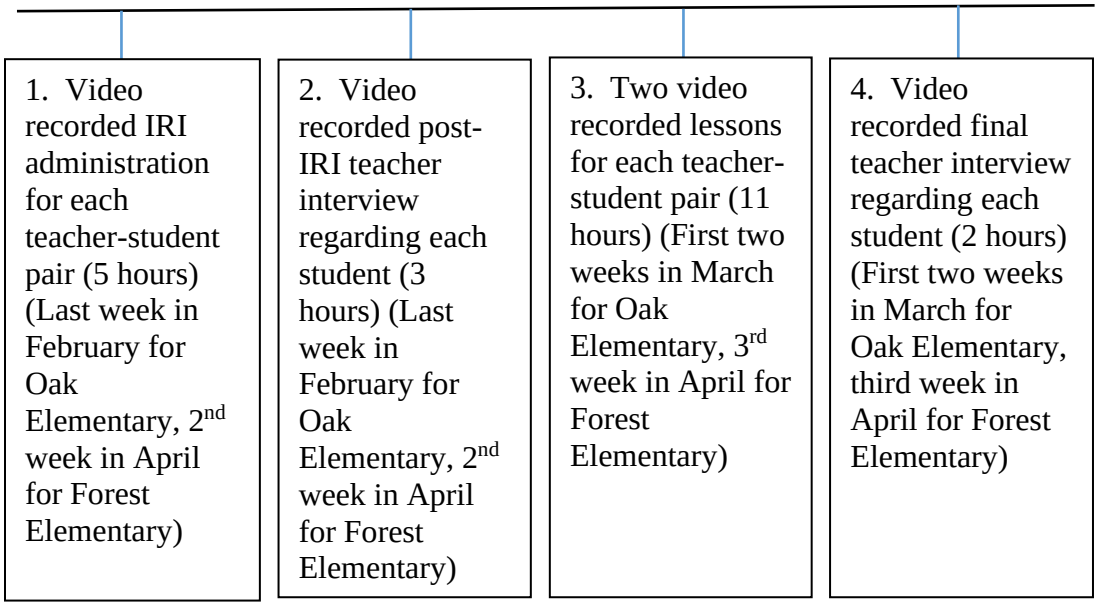


Figure 4.1. Data Collection Sequence

Assessment System (BAS) toward the end of their second trimester. The teachers at Forest Elementary School administered the Developmental Reading Assessment, 2nd ed. (DRA2) toward the end of their third quarter. Appendix B presents administration procedures for both BAS and DRA2 (Beaver, 2006; Fountas & Pinnell, 2011). Because this study investigated teachers' IRI administration at a single time point and did not compare teachers' administrations overtime, the five-week time difference did not affect data analysis. Five hours of video recorded IRI administration data were collected. Digital photos were taken of the IRI documents that teachers scored from each of these sessions.

Step 2: Post-IRI teacher interviews. Within one day after the video recorded IRI administrations, the investigator conducted a video recorded semi-structured teacher interview. These interviews allowed the investigator to maintain consistency concerning concepts covered but provided some flexibility for teachers to discuss their varying thoughts, feelings, and ideas related to their video recorded IRI data collection, scoring, and upcoming instruction for comprehension (Corbin & Strauss, 2015). Appendix C presents the post-IRI interview questions. Post-IRI interviews ranged from 7 minutes and 10 seconds to 26 minutes and 19 seconds with a mean of 5 minutes and 26 seconds per teacher-student pair. Teachers with a higher number of students had longer interviews (e.g., Teacher E, 26 minutes, 19 seconds) while teachers with fewer students had shorter interviews (e.g., Teacher C, 7 minutes 10 seconds).

Step 3: Reading lessons. After the assessment data and interviews were collected, the investigator video recorded the next two reading lessons that occurred with each teacher-student pair. The investigator asked each teacher to provide the dates and

times during which the next two lessons would occur with focal students. She then attended the class to video record the lessons during those times. During reading lessons, teachers chose different contexts in which to address assessment-based instruction goals, including whole class, small guided reading groups, or one-on-one instruction. These lessons took place during the time of day when reading lessons would normally occur within each classroom. Lessons ranged from 4 minutes and 30 seconds to 32 minutes and 13 seconds depending on the age of the children and whether the lesson was provided through whole group instruction, small group guided reading, or one-to-one instruction. In addition, teachers' instructional lesson plans, notes, and students' work from each observed lesson were digitally photographed immediately following the lesson and saved as artifacts.

Step 4: Final interviews. After the lesson data were collected, the investigator conducted video recorded semi-structured teacher final interviews regarding the two lessons. Appendix D contains the questions asked during the final interviews. Final interviews focused on lesson objectives, instructional methods, and student learning. They ranged from 6 minutes, 58 seconds to 15 minutes, 42 seconds, with a mean of 4 minutes and 14 seconds per teacher student pair.

Step 5: Transcription and transcript preparation. Video recorded IRI comprehension administrations, teacher interviews, and lessons were all transcribed. Transcriptions included spoken words as well as actions of each participant, and as much as possible, paralinguistic notations were made regarding intonation, overlapping speech, rate of speech, pauses, etc.

Transcripts were broken into meaning units. A meaning unit is defined as "a segment of text that is comprehensible by itself and contains one idea, episode, or piece of information" (Tesch, 1990, pg. 116). For example, Teacher A's follow-up question to Amari, "Anything else you want to tell me about what you learned?" represented one meaning unit because it contained one follow-up question asked during IRI administration. Next, the meaning units for each data source were entered on separate rows within a tab of an Excel sheet. In all, 358 meaning units were coded for this study.

Data Coding and Analysis

Research question 1. Open coding and constant comparative analysis were used to develop in vivo codes to label what occurred during IRI administration videos and how teachers' collected comprehension data as compared to what data should have been collected based on the IRI instruction manuals (Beaver, 2006; Boeije, 2010; Corbin & Strauss, 2015; Fountas & Pinnell, 2011). Codes emerged through iterative rounds of coding, discussion with another literacy expert, and recoding (Corbin & Strauss, 2015). Final codes, their definitions, and examples from the administration videos are presented in Tables 4.2 and 4.3.

At the completion of code development, the investigator taught a literacy Ph.D. student the codes by providing definitions and examples and practice in applying the codes. After receiving feedback for a purposeful selection of 10% of the data that reflected examples from each data source and from each teacher in the database, the investigator and literacy Ph.D. student separately coded 100% of the meaning units from two data sources: video recorded IRI administration and post-IRI interview. Intercoder

Table 4.2. Data Source: IRI Administration Codes with Definitions and Examples

Code	Definition	Example
	NOTE: Use for BAS Administration Teachers A-E	
Within text prompt	The teacher asks the prompts/questions in the "Within-text" portion of the key understandings	Tell me about the kinds of equipment that you need to take on a fishing trip.
Beyond the text prompt	The teacher asks the prompts/questions in the "Beyond the text" portion of the key understandings	Okay. Explain why fishing is so complicated.
About the text prompt	The teacher asks the prompts/questions in the "About the text" portion of the key understandings	Why is that a good title for this book?
Open-ended follow up question	The teacher uses an open-ended follow-up question to get the child to give more information about their reading. NOTE: Use for DRA2 Administration Teachers F-I	What else?
Beyond the Text-Interpretation Reflection, or Connections questions	The teacher asks the interpretation, reflection, or making connections questions given on the IRI form.	What do you think the author's trying to tell you in this story? What part did you like the best in the story and tell me why you liked that part? Then what does this make you think of or what connections can you make when you read the story?
Uses given prompt/question for comprehension	The teacher reads the comprehension questions/prompts on the teacher administration form word for word. OR The teacher reads the given comprehension questions/prompts on the form but substitutes words to make it sound conversational or child-friendly, however, the meaning has not been changed by the word substitution nor has any information been added or deleted. NOTE: Use for all teachers A-I	What happened after that?
Uses broad initial open-ended prompt	The teacher gives the broad initial open-ended prompt to get the child to begin to talk about what they read.	Talk to me about what you learned in this book.
Closed prompt for more info (not given by the directions)	The teacher asks a closed question or gives a prompt as a follow-up question that isn't given on the direction form. This question is a closed (specific) question and not an open-ended question	Do you know what those are called?

Table 4.3. Data Source: Post- IRI Interview Codes with Definitions and Examples

Code	Definition	Example
Next step-further assessment	The teacher will have the child read additional levels of the IRI either to move up or down a level based on the results of the video recorded assessment. This assessment will take place soon but not during this video recorded session	Still too hard for her so I'm gonna [sic] have to go back to "P" and give that one a try.
Upcoming instruction will focus on comprehension	The teacher identifies a comprehension skill or strategy that the student has a need in and will teach that skill or strategy during the upcoming instruction (See above for detailed comprehension description).	Because her needs seem to be more in the comprehension, I would probably see what other students at her level are having the same kind of strengths and needs, maybe not so much the strengths but have the same need of pushing it and thinking beyond and deepening the responses.
Upcoming instruction will focus on picture walk	The teacher indicates that the student has a need to use pre-reading strategies including taking a picture walk to facilitate making a connection between the picture walk, later reading and finally retelling a story.	This way I can kinda [sic] see where I need to work with him also on taking a picture walk.

agreement was high (91-94%; x = 92%) across sources. Consensus was achieved through discussion. Consensus codes were used for analysis.

For analysis, first data were analyzed by transcript type using open coding and constant comparative analysis. For example, the investigator looked across all post-IRI administration interviews for every teacher-student pair to identify patterns *across teachers* for each data source. Initially, open codes were identified, such as "follow-up questions," then these were merged or disaggregated into new categories, such as disaggregating "follow-up" questions into two codes: "open-ended" and "closed." Then, the data were reorganized by teacher. Each teacher's coded meaning units were entered in one tab and organized by data type (IRI administration, post-IRI interview) within that tab. This type of organization allowed the investigator to use open coding and constant comparative analysis to identify patterns within each teacher. Initially, codes were identified such as "open-ended follow-up questions," then these were further disaggregated into three codes: "open-ended follow-up questions" asked of 1) high, 2) moderate, or 3) low readers. Patterns are articulated in detail with examples from the data in the results section.

Research question 2. To identify how teachers scored comprehension sections of the IRI data, teachers' codes were compared by two literacy experts' coders. As in previous research, where professors were used as literacy experts, this investigator used two literacy experts for coding (L'Allier, 2013). One literacy expert has an MAT in literacy and Reading Recovery training, and the other has a Ph.D. in literacy, expertise in literacy assessment, and assessment-based instruction. Each separately viewed the video recorded IRI administrations and scored each child's comprehension section on a

photocopy of the teacher scored IRI document according to IRI administration and scoring procedures (Beaver, 2006; Fountas & Pinnell, 2011).

Next, these two literacy experts engaged in iterative rounds of open coding and constant comparative analysis, discussion, and recoding of a purposeful selection of 10% of the data from across teachers to develop codes that reflected how teachers scored the IRI comprehension sections according to IRI instruction manuals (Beaver, 2006; Corbin & Strauss, 2015; Fountas & Pinnell, 2011). Two categories of codes emerged based on a comparison of classroom teachers' scoring against the two literacy experts' scoring. Scoring completeness referred to the extent to which teachers scored all of the content that literacy experts expected to be scored based on the instructions in the IRI manual, and scoring accuracy referred to the extent to which teachers scored the content in the same way as the literacy experts who scored based on the instructions in the IRI manual. Within each category, gradations of how teachers scored were identified using axial codes. Final codes, their definitions, and examples are presented in Table 4.4. Teachers' scoring completeness ranged from completely scored to not scored at all. Teachers' scoring accuracy ranged from completely accurate to completely inaccurate or not scored at all.

The two literacy expert coders applied the final codes to 100% of comprehension sections administered by teachers. In all, there were 67 comprehension sections administered: 9 preview/predict, 23 within the text, 23 beyond the text, and 12 about the text. Intercoder agreement was high (93%). Data were analyzed both across and within teachers, as described in the methods for research question one, to identify patterns regarding teachers' scoring completeness and accuracy.

Table 4.4. Codes, Definitions, and Examples: Completeness and Accuracy of Scoring

Code	Definition	Example(s)
Completeness of Scoring		
Completely scored	The teacher scored the given section for BAS or all components of a section for DRA2.	A teacher circled or otherwise noted a score on the Within the Text section of the BAS. OR A teacher scored each section of the Within the Text section including sequence of events, characters and details, vocabulary, and teacher support for DRA2.
Partially scored	The teacher scored some components of a section	A teacher only scored 1, 2, or 3 of the 4 components of the Within the Text section for DRA2.
Not scored	The teacher did not score the given section for BAS or any components of a section for DRA2	A teacher did not score the student's About the Text section for BAS. OR A teacher did not score both the Reflection and Making Connections components of the About the Text Section on the DRA2.
NA	There were no questions or sections to score.	No Preview/Prediction questions or sections exist for that administration.
Accuracy of Scoring		
Completely accurate	The teacher correctly scores every section	The literacy expert coders and the teachers scores matched.
Mostly accurate	The teacher is mostly correct in scoring the section. OR The teacher correctly scores most components of the sections.	The literacy expert coders and the teacher are within one score on BAS (example coders 2, teacher 3). For DRA2, 51% or more are scored correctly
Evenly accurate/inaccurate	The teacher correctly scores half of the components of the section.	The literacy expert coders and the teachers scores matched for half of the sections
Mostly inaccurate	The teacher is mostly inaccurate in their scoring or the teacher incorrectly scores most components of the section.	The literacy expert coders and the teacher are two scores off on BAS (for example teacher 1, coders 3). For DRA2, 49% or less are scored correctly
Completely Inaccurate	The teacher incorrectly scores all the section or all components of the sections.	The literacy expert coders and the teacher are 3 scores off on BAS (for example, teacher 0, coders 3). For DRA2, 0% of components in a section are correctly scored.
Used Adjusted Scores:	The teacher scores the child's comprehension but does not use the given 4-point scale.	The teacher uses half points i.e. 1.5 or 2.5 or the teacher circles multiple scores i.e. the teacher circles 2 and 3
NA	There were no instances to score.	No Beyond the Text questions or sections exist for that administration.

Research question 3. To characterize how teachers identified comprehension objectives based on IRI data, first the lesson objectives identified by each teacher were highlighted in the database. Most often these occurred during the teachers' post-IRI interviews, but also sometimes during IRI administration videos. Then, each teacher-identified objective was compared to the objectives identified by the literacy experts during their data analysis. Through iterative rounds of open coding, discussion between literacy experts, and recoding (Corbin & Strauss, 2015), gradations of how teacher-identified comprehension objectives aligned with the literacy experts' identified objectives emerged: accurate, partially accurate, inaccurate, not provided, or not applicable (NA; e.g., the student scored 100% on comprehension so no comprehension needs were identified). For example, a teacher's "accurate" identification of objectives would be a match with objectives also identified by the two experts. The two literacy experts separately coded the gradation of accuracy for each objective. Intercoder agreement was high (96%). Final codes, their definitions, and examples are presented in Table 4.5. Patterns are articulated in detail with examples from the data in the results section.

Research question 4. To identify how teachers applied objectives to instruction, the two reading lessons for each teacher-student pair were viewed and coded. Using open coding and constant comparison (Corbin & Strauss, 2015), gradations of how teachers addressed the stated objectives with each student were identified: appropriate instruction, partially appropriate instruction, or no appropriate instruction. For example, appropriate instruction accurately addressed the teacher stated objectives while partially appropriate instruction somewhat or incompletely addressed the objective. These codes were applied

Table 4.5. Final Codes, Definitions, and Examples: Accuracy of Teacher-Stated Lesson Objectives and Appropriateness of Follow-Up Instruction

Code	Definition	Example
Accuracy of teacher-stated lesson objectives		
Accurate	what teacher states aligns with the data's indication for a specific objective	I think main idea is what he needs to work on, because he was able to recall a lot of facts but when it got to the question about, "Well why are caves important?" he didn't understand. So, like the synthesizing, so here's all this information, if we put it all together, what does that tell us.
Partially Accurate	what the teacher says is partially accurate - e.g., too broad or vague to guide instruction well	Go back into the text for comprehension- teacher C, Anabelle
Inaccurate	what teacher says does not align with assessment data	understanding the words- Teacher I, Kaya
Not provided	teacher doesn't provide an objective for an area even though the assessment data showed an objective was needed	No objective provided-Teacher D, Alejandro
NA	there is no assessment data that inform this area	Comprehension score= 100%; Teacher B, Leah
Appropriateness of follow-up instruction		
Appropriate instruction while	Instruction accurately addressed the teacher stated objectives	Teacher stated objective: Retelling the story in sequence and provided instruction by teaching Kiara to retell the events of the story in order using the terms first, then, next, and last.
Partially appropriate instruction	Instruction somewhat or incompletely addressed the objective	Teacher stated objective: need instruction in using what he learned in the picture walk to help him do the retelling. During the first lesson, Teacher H's instruction focused on picture walks while the second lesson focused on retelling. However, Teacher H did not provide instruction about how to connect the picture walk to supporting the retelling
No appropriate instruction	Instruction addressed an objective other than the teacher stated objective.	Teacher stated objective: Go back into the text for comprehension- the teacher did not address this objective during the lessons

by the investigator. Final codes, their definitions, and examples are presented in Table 4.5. Data were analyzed to identify patterns both across and within teachers. Patterns are articulated in detail with examples from the data in the results section.

Triangulation. To confirm or disconfirm patterns, triangulation was used across multiple data sources. For research questions 1-2, patterns were identified across digital photos of teacher scored IRI administrations (artifacts), expert scored IRI comprehension sections, video recorded IRI administrations with each teacher student pair, and post-IRI teacher interviews. To confirm or disconfirm patterns for research questions 3-4, patterns were identified across data sources including digital photos of lesson plans, students' lesson artifacts, expert scored lesson objectives, video recorded lessons with each teacher student pair, and final teacher interviews.

Results

This study examined four research questions, each focused on one aspect of teachers' use of IRI data. The following subsections present the patterns identified to address each of the four research questions: How do teachers (1) collect, (2) score, (3) identify objectives, and (4) address objectives for instruction based on IRI comprehension data?

How Do Teachers Collect Comprehension Data from IRIs?

Three patterns describe how teachers collected comprehension data from IRIs: (1) most teachers administered the within, beyond, and about the text questions, (2) just 61% of teachers administered the initial broad retelling prompt, (3) there was variation in teachers' use of open-ended or closed follow-up questions.

Within, beyond, and about the text questions. Across BAS and DRA2 administrations, all but one teacher administered every within, beyond, and about the text questions. Teacher F was the exception and did not administer the last beyond the text question. Teacher F explained in the post-IRI interview that they skipped this question because the child exhibited difficulty with the oral reading, the retelling, and the first beyond the text question.

Initial broad retelling prompt. Teachers varied as to whether they asked the initial broad retelling prompt (i.e., Talk about what you learned in this book). Sixty-one percent of teachers used this prompt. Three teachers, who all administered the BAS, omitted the initial broad retelling prompt and began with the within the text questions instead. Teachers B and D omitted the initial broad retelling prompt during all their administrations. Teacher E asked the initial broad retelling prompt during one administration for which it was listed as the first question in the within the text section, however omitted it during all other administrations.

Follow-up questions. Teachers varied considerably in the extent to which they used follow-up question (lots versus few), the types they used (open-ended versus closed), and to whom they asked these questions (high, moderate, or low readers). Open-ended follow-up questions, which are suggested for use by both the BAS and DRA2 manuals (Beaver, 2006; Fountas & Pinnell, 2011), were used by teachers during 43% of administrations to gain additional information from students. For example, teachers asked, “And then what happened?” Teachers asked 24 open-ended questions in total; ten during BAS administrations and 14 during DRA2 administrations. Teachers administering the BAS asked two or three open-ended questions across sections.

Teachers who administered the DRA2 only asked open-ended questions during the retelling, but not during the beyond the text questions. Figure 4.2 presents the number of open-ended and closed questions asked by teachers during BAS and DRA2 administrations by section type.

Closed questions were asked by teachers during 61% of administrations. BAS and DRA2 manuals (Beaver, 2006; Fountas & Pinnell, 2011) recommend avoiding these, since they might lead students to a specific answer. Teachers administering the BAS asked more closed questions during the about the text section than other sections. Teachers administering the DRA2 asked more closed questions during the retelling than during the beyond the text section. Teachers asked closed questions for a variety of purposes: to clarify details about the text (e.g., "There was a cave in this book. Do you remember hearing about a cave or reading about a cave?"). Teachers also asked closed questions about specific events that took place (e.g., "You mentioned a bald eagle, was there another kind of animal that scared them?") and to help with correct sequence of the story (e.g., "Hmm. You think that was the first trick?"). These closed questions provided support for students' responses to the comprehension questions, potentially elevating their score.

Teachers asked zero closed questions during 39% of IRI administrations, a small number of closed questions (1-3) during 39% of administrations, and a larger number of closed questions (4-15) during 22% of administrations. Larger numbers of closed questions were asked only by Teachers D and H. Teacher D asked 26 closed questions across three IRIs, including 14 to a student identified as a low reader, and 4 and 8, respectively, to students who were identified as high readers. Teacher H asked 25 closed

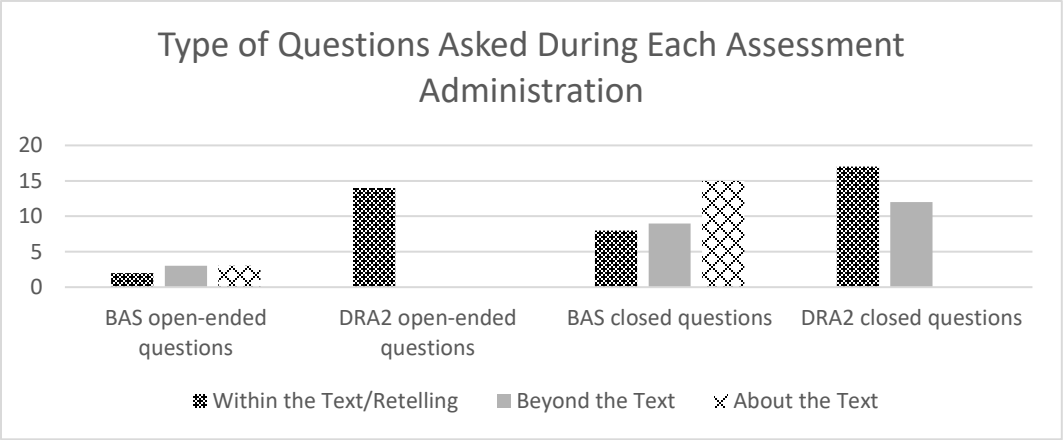


Figure 4.2. Number of Open-Ended and Closed questions Asked During BAS and DRA2 by Section

questions across two IRIs, including 15 to a student identified as a moderate reader and 10 to a student identified as a low reader.

Overall, when comparing open-ended versus closed questions, teachers asked a greater percentage of open-ended questions to students who were identified as "moderate" readers. Conversely, teachers asked more closed questions to "low" readers. Figure 4.3 presents the percentage of open-ended and closed questions asked of students at differing reading levels.

How Do Teachers Score Comprehension Data from IRIs?

Two patterns describe how teachers scored comprehension data from IRIs: (1) most teachers completely scored the comprehension sections, (2) of the sections that were completely scored, 98% were scored completely accurately or mostly accurately.

Completeness of scoring. Across BAS and DRA2, teachers completely scored 75% of administrations, partially scored 1%, and did not score 24%. Five teachers

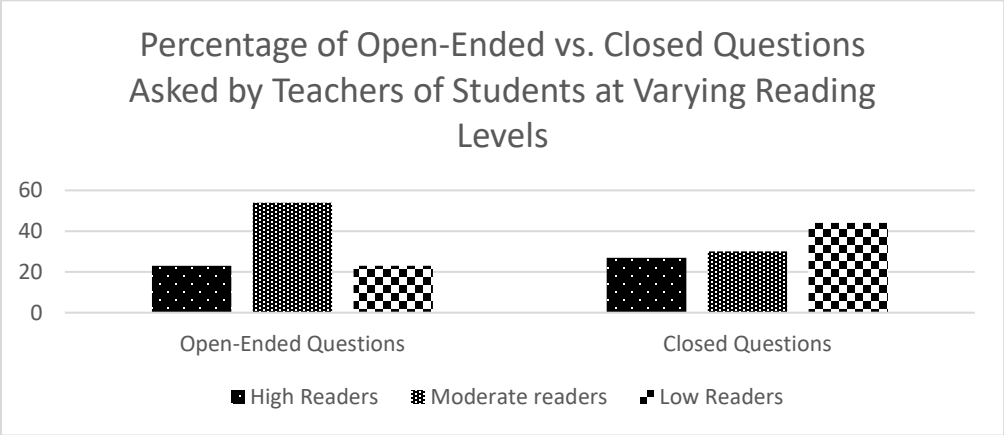


Figure 4.3. Percentage of Open-Ended and Closed Questions Asked by Teachers of Readers at High, Moderate, and Low Reading Levels

completely scored all administered IRIs. Teachers A and E each did not score the comprehension sections for one of the IRIs that they collected, but completely scored all comprehension sections for the other two IRIs. Teacher F completely scored two IRIs, and partially scored the third IRI. Teacher D did not score any comprehension sections for any of the three IRIs collected. Table 4.6 presents two literacy experts' consensus codes for completeness of scoring for each teacher-student pair.

Teachers did not score comprehension sections for several reasons. In Teacher A's post-IRI interview, the teacher discussed that Sadie's IRI performance did not match their classroom observations of Sadie's comprehension skills. This may have been why Teacher A did not score Sadie's comprehension sections. In Teacher E's post-IRI interview, they described, "Cameron's comprehension was so detailed, his linguistic spillover was fantastic. He was really interpreting. He nailed the comprehension." Thus,

Table 4.6. Completeness of Scoring, Consensus Codes

	Completeness of scoring Preview/ Prediction section	Completeness of scoring Within Text section	Completeness of scoring Beyond the Text section	Completeness of scoring About the Text section
Teacher A/Amari	NA	completely scored	completely scored	completely scored
Teacher A/ Sadie	NA	not scored	not scored	not scored
Teacher A/ Simon	NA	completely scored	completely scored	completely scored
Teacher B/ Tyrone	NA	completely scored	completely scored	NA
Teacher B/ Leah	NA	completely scored	completely scored	NA
Teacher C/ Anabelle	NA	completely scored	completely scored	completely scored
Teacher D/ Andrew	NA	not scored	not scored	not scored
Teacher D/ Alejandro	NA	not scored	not scored	not scored
Teacher D/ Maria	NA	not scored	not scored	not scored
(Class 1) Teacher E Carol	NA	completely scored	completely scored	completely scored
Teacher E /Jennifer	NA	completely scored	completely scored	completely scored
Teacher E/Jasmine	NA	completely scored	completely scored	completely scored
(Class 2) Teacher E Cameron	NA	not scored	not scored	not scored
Teacher E/Reed	NA	completely scored	completely scored	completely scored
Teacher F/Deidre	completely scored	completely scored	completely scored	NA
Teacher F/Micah	completely scored	partially scored	not scored	NA
Teacher F/Donovan	completely scored	completely scored	completely scored	NA
Teacher G/Kiara	completely scored	completely scored	completely scored	NA
Teacher G/ Breslyn	completely scored	completely scored	completely scored	NA
Teacher H/ Desmond	completely scored	completely scored	completely scored	NA
Teacher H/Alonzo	completely scored	completely scored	completely scored	NA
Teacher I/Kaya	completely scored	completely scored	completely scored	NA
Teacher I/Adrianna	completely scored	completely scored	completely scored	NA

they might not have scored Cameron's comprehension sections because they felt that he had done so well. Finally, Teacher F, who did not administer the last beyond the text question, completely scored the preview/prediction section, partially scored the retelling, and did not score the beyond the text section, despite that Teacher F could have completely scored the retelling section and the single beyond the text question that was administered. The teacher may have felt scoring the comprehension sections was not worthwhile, however, it would have provided more data from which to inform objectives.

Accuracy of scoring. Of the 75% of comprehension sections that were completely scored, teachers scored 98% of sections completely or mostly accurately. Fifty-one percent were scored completely accurately, 47% scored mostly accurately, and 2% scored mostly inaccurately. Table 4.7 presents two literacy experts' consensus codes for accuracy of scoring for each teacher-student pair. However, when all 23 IRIs in the study are considered, including those that were not administered or scored completely, teachers scored just 39% of comprehension sections completely accurately and 36% of sections mostly accurately. Additionally, 24% of sections were inaccurately scored, not scored, or not administered.

How Do Teachers Identify Comprehension Objectives?

Two patterns describe how teachers identified comprehension objectives based on data from IRIs: (1) just 65% of teachers identified comprehension objectives for students, (2) there was variation in teachers' ability to accurately identify comprehension objectives.

Table 4.7. Accuracy of Scoring, Consensus Codes

	Accuracy of scoring Preview/ Prediction section	Accuracy of scoring Within Text section	Accuracy of scoring Beyond the Text section	Accuracy of scoring About the Text section
Teacher A/Amari	NA	completely accurate	completely accurate	completely accurate
Teacher A/ Sadie	NA	not scored	not scored	not scored
Teacher A/ Simon	NA	mostly accurate	completely accurate	completely accurate
Teacher B/ Tyrone	NA	completely accurate	completely accurate	NA
Teacher B/ Leah	NA	completely accurate	completely accurate	NA
Teacher C/ Anabelle	NA	completely accurate	completely accurate	completely accurate
Teacher D/ Andrew	NA	not scored	not scored	not scored
Teacher D/ Alejandro	NA	not scored	not scored	not scored
Teacher D/ Maria	NA	not scored	not scored	not scored
(Class 1) Teacher E Carol	NA	mostly accurate	mostly accurate	mostly accurate
Teacher E /Jennifer	NA	mostly accurate	mostly accurate	completely accurate
Teacher E/Jasmine	NA	mostly accurate	mostly accurate	mostly accurate
(Class 2) Teacher E Cameron	NA	not scored	not scored	not scored
Teacher E/Reed	NA	mostly accurate	mostly accurate	mostly accurate
Teacher F/Deidre	completely accurate	completely accurate	mostly accurate	NA
Teacher F/Micah	mostly accurate	mostly accurate	not scored	NA
Teacher F/Donovan	completely accurate	completely accurate	completely accurate	NA
Teacher G/Kiara	completely accurate	mostly accurate	mostly accurate	NA
Teacher G/ Breslyn	completely accurate	mostly accurate	completely accurate	NA
Teacher H/ Desmond	mostly accurate	mostly accurate	completely accurate	NA
Teacher H/Alonzo	mostly inaccurate	mostly accurate	completely accurate	NA
Teacher I/Kaya	completely accurate	completely accurate	mostly accurate	NA
Teacher I/Adrianna	mostly accurate	mostly accurate	completely accurate	NA

Identification of comprehension objectives. Across BAS and DRA2 seven teachers identified comprehension objectives for 65% of students. No comprehension objectives were identifiable (due to perfect scoring) for 9% of students. Three teachers did not identify a comprehension objective for the remaining 26% of students. However, data showed that all these students could have benefitted from comprehension instruction. For example, based on two expert coders' consensus, one student poorly answered both the beyond and about the text questions but did not have a comprehension objective identified for her.

Accuracy of comprehension objective identification. There was variation in teachers' ability to accurately identify comprehension objectives. Of the 65% of students for whom a comprehension objective was identified, five teachers accurately identified objectives for 30% of students. For example, Teacher A accurately identified the following comprehension objective:

> I think main idea is what he needs to work on, because he was able to recall a lot of facts but when it got to the question about, "Well why are caves important?" he didn't understand. So, like the synthesizing, so here's all this information, if we put it all together, what does it tell us.

Based on the literacy experts' consensus codes for the comprehension questions, the student did need instruction to support synthesizing information to identify a main idea.

Partially accurate objectives were identified by five teachers for 26% of students. For example, Teacher C identified "go back into the text for comprehension," which was broad and did not identify a specific aspect of comprehension to be addressed by this

method. Based on both experts' consensus codes, comprehension monitoring was the more specific objective that should have been addressed.

One teacher identified inaccurate objectives for 9% of students. Teacher I stated that Kaya needed to work on "understanding the words." However, based on both experts' consensus codes for Kaya's comprehension responses, there was no evidence that she had this difficulty. In fact, the transcript showed that she used advanced vocabulary from the story in her retelling.

How Do Teachers Address Comprehension Objectives During Instruction?

Two patterns describe how teachers provided instruction for comprehension objectives: 1) there was variation in teachers' ability to provide instruction based on accurate objectives, 2) teachers were more likely to provide appropriate instruction for partially accurate comprehension objectives.

Instruction of accurate comprehension objectives. There was variation in teachers' ability to provide instruction based on accurate objectives. Of the 30% of students for whom teachers identified accurate comprehension objectives, 57% received appropriate instruction. For example, Teacher G identified that Kiara needed instruction in retelling the story in sequence and provided instruction by teaching Kiara to retell the events of the story in order using the terms first, then, next, and last.

Additionally, 43% of students whose teachers had identified accurate objectives received partially appropriate instruction. For example, Teacher H stated that Desmond needed instruction in using the information that he gathered during the picture walk to help him retell the story. During the first lesson, Teacher H's instruction focused on picture walks while the second lesson focused on retelling.

However, Teacher H did not provide instruction about how to connect the picture walk to supporting the retelling.

Instruction of partially accurately identified comprehension objectives. Teachers were more likely to provide appropriate instruction for partially accurate objectives. Of the 26% of students whose teachers had identified partially accurate objectives, 83% received appropriate instruction. For example, Teacher E identified that Carol needed instruction in "word meanings including academic and common words," which was a vague and partially accurate objective. However, instruction focused on strategies to problem solve topic related vocabulary including using the glossary and the "read around strategy" with the goal of being able to teach peers about the previously unknown word.

Discussion

The goals of this study were to investigate how teachers 1) collect and 2) score comprehension data from IRIs and use the resulting data to 3) inform comprehension objectives and 4) instruction. The findings from this study extend current research in important ways.

Collection and Scoring

The findings from this study provide information about how teachers collect and score comprehension data from their IRIs within the everyday practices of their classrooms. In contrast, previous research focused on the practices of graduate students in practicum settings during their coursework (Applegate & Bucci, 2013; Johns & L'Allier, 2003; L'Allier 2013; Roberts, 1974) or researcher-teacher teams working together in

classrooms (Diehl, Armitage, Nettles, and Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013).

The findings show that teachers completely scored 75% of comprehension sections. Of those that were scored 98% were scored completely or mostly accurately. This coheres with previous research findings that graduate students were "consistently accurate" in scoring their students' comprehension questions (L'Allier, 2013, p. 303).

This study's findings also extend previous research by showing that all teachers administered the suggested comprehension questions, but teachers varied in their use of the initial broad retelling prompt. Teachers also varied in the amount and types of follow-up questions they asked (open or closed), as well as the type of reader (low, moderate, or high) to whom they asked the questions. Previous research had not investigated these issues.

Identifying Comprehension Objectives and Follow-up Instruction

The findings from this study show that teachers can identify multiple kinds of comprehension objectives for students using data from IRIs and further use that data to inform instruction. This finding coheres with previous research findings from graduate interns in practicum settings and researcher-teacher teams who used IRI assessments to inform reading instruction (Applegate & Bucci, 2013; Diehl, Armitage, Nettles, and Peterson, 2011; Menzies, Mahdavi, & Lewis, 2008; Mraz, et al., 2013). Likewise, the findings show how teachers use comprehension data from IRIs to inform a broad range of comprehension objectives and instruction, extending previous studies that focused on identifying miscues, and reading levels, or identifying graduate students' needs based on

only inference question responses (Johns & L'Allier, 2003; L'Allier 2013; Roberts, 1974).

Findings from this study show that teachers identified accurate comprehension objectives for 30% of students. This extends previous research in which graduate students identified 66% of the key recommendations for upcoming instruction made by experts across word recognition, fluency, and comprehension (L'Allier, 2013). Present findings suggest that comprehension objectives may be more difficult for teachers to identify as compared with other objectives (e.g., word recognition and fluency). That may be why the graduate students in L'Allier's (2013) study identified a higher percentage of objectives that aligned with experts as compared with the teachers in this study. Also, the findings from this study extend previous research which showed that just four teachers made key recommendations regarding inferring, while seven teachers neglected to identify inference needs for their students (L'Allier, 2013). This suggests that inference needs may be particularly difficult for teachers to identify. Finally, the findings from this study extend previous research by showing that teachers who identified partially accurate comprehension objectives still provided appropriate instruction 83% of the time. Previous research had not investigated this issue.

Implications

Teacher Strengths

This study shows that some teachers have "considerable expertise" in some areas needed to collect and score comprehension data from IRIs, and further to use this data to inform instruction (ILA & NCTE, 2010, p. 14). All teachers administering the BAS asked the within, beyond, and about the text questions. Likewise, all teachers administering the

DRA2 prompted their students to retell the story. Many teachers gained additional information from students by asking open-ended questions. Many of the teachers completely scored their students' comprehension sections, and of those scored many were scored accurately. These strengths demonstrated teachers' pedagogical content knowledge for administering and scoring IRIs.

Professional Development for Collection and Scoring

The findings showed that teachers had many needs for increasing their expertise. Findings suggest four needs for professional development related to IRI comprehension collection and scoring. First, teachers need to develop pedagogical content knowledge regarding the value of administering the initial broad retelling prompt, given that the data showed teachers did not ask this prompt for 39% of students. Teachers should use initial broad prompts to set the tone of the "comprehension conversation" or "reading conference" to show children that their ideas and thoughts are valued rather than starting with a series of questions which could lead children to think that the goal of reading is to get the correct answer (Fountas & Pinnell, 2011, p. 25). Further, this type of prompt can add to a teacher's pedagogical content knowledge as information is gained about a student's knowledge of text structure, sequencing, synthesis of story information, etc.

Second, teachers need professional development to develop pedagogical content knowledge concerning open-ended versus closed questions, and the type of scaffold that each type of question provides, given that closed questions that are not allowed by either IRI were asked almost four times more often than open-ended questions that are allowed (Beaver, 2006; Fountas & Pinnell, 2011). Related to this, teachers need to learn to frame questions in an open-ended manner to allow the child's thinking to be revealed, rather

than the child's thinking being influenced by the teacher's follow-up questions. This will help avoid the pitfalls of asking closed questions (1) children could get a higher comprehension score than they would have been able to garner on their own, and (2) this might lead to not identifying all a student's needs.

Third, teachers need to learn the benefits of scoring all comprehension sections, given that the data showed teachers did not score 24% of the comprehension sections. One could argue that the score itself is not as important as identifying accurate comprehension objectives. However, of the five students whose administrations were left completely unscored, only one student's teacher accurately identified an objective for an upcoming lesson. For the other four students, whose comprehension sections were either not scored or partially scored, no comprehension objectives were identified. This suggests that teachers who do not score comprehension sections are unlikely to identify comprehension objectives for upcoming instruction showing a lack of pedagogical content knowledge.

Fourth, teachers need professional development to increase their pedagogical content knowledge to improve their accuracy of comprehension scoring on IRIs, given that just 51% of sections were scored completely accurately. This might improve accurate identification of students' comprehension objectives for upcoming instruction, since findings showed that teachers who scored accurately also often identified accurate instructional objectives.

Professional Development for Objective Identification and Follow-up Instruction

Findings suggest three needs for professional development related to objective identification and follow-up instruction based on IRI comprehension data. First, teachers

showed they needed professional development for building pedagogical content knowledge related to identifying accurate comprehension objectives. While most teachers identified comprehension objectives for upcoming instruction, only about 30% were accurate.

Second, teachers need professional development to improve their content knowledge to articulate appropriate objectives more clearly. Teachers who identified partially accurately comprehension objectives were more likely to provide appropriate instruction than those teachers who identified accurate comprehension objectives. This suggests that some teachers need content knowledge to name the comprehension strategies that need to be taught.

Third, findings suggest that teachers need to develop pedagogical content knowledge to better inform appropriate comprehension instruction. This seems much needed because this study showed that only 57% of students whose teachers identified accurate comprehension objectives received appropriate instruction for their identified area of need.

Limitations

This research has four limitations. Relative to each, suggestions for future research directions are provided. First, this research was conducted with a limited sample size across two districts in one state. Due to parental permissions received, it was not possible for every teacher to choose students at each reading level high, moderate, and low. Future research could include a larger group of teachers and students across several districts and/or states garnering an equal number of students from each reading level.

Second, instruction which included the teacher-stated objectives may have occurred at a time other than during the two observed reading lessons. Although teachers indicated when the next two reading lessons would occur, instruction may have occurred before the video recorded lessons. Teachers also may have addressed stated objectives during future lessons for a variety of reasons including following the district reading curriculum or providing instruction during guided reading that met other students' needs before addressing the needs of the focal student.

Third, this manuscript is limited to the analysis of the comprehension portions of the IRI. Further research could focus on the classroom practices of teachers for word recognition accuracy or fluency objectives including collection, scoring, identifying objectives, and providing instruction.

Fourth, this research included one administration of an IRI per teacher-student pair and two follow-up lessons. Research could be extended to include multiple IRI administrations (e.g., fall, winter, spring) and observations of more reading lessons over an extended period of time.

Future Research Directions

Future research should focus on how to increase teacher knowledge regarding accurate collection, scoring, objective identification, and follow-up instruction based on IRI comprehension data. Given that teachers had different strengths and needs in these areas, individualized professional development should be explored. For example, Teacher H could benefit from professional development in collection, scoring, and identifying objectives, while Teacher I could benefit from professional development on identifying

objectives. By targeting each teacher's specific needs, their skills might be honed more quickly, possibly resulting in better student outcomes

CHAPTER FIVE

DISCUSSION AND FUTURE RESEARCH DIRECTIONS

My research agenda has focused on helping teachers build knowledge to improve literacy instruction. The papers in this dissertation represent examples of this agenda and focus on 1) teacher knowledge enacted prior to instruction and 2) teacher knowledge enacted during literacy instruction. To extend the findings of these studies on teacher knowledge, I envision building my future research agenda to include the investigation of the kinds of professional development that can help build teachers' knowledge with regard to 1) digital texts/tools in literacy instruction and 2) IRI assessment use and related assessment-based instruction, including both knowledge enacted prior to and during literacy instruction.

Previous research, including my own, documents teachers' difficulties with selecting and integrating digital texts and tools in literacy instruction (Baxa & Christ, 2017; Christ, Baxa, & Arya, under review; Israelson, 2014; Zoch, Belcher, & Meyers, 2016). Future research regarding how teachers select and integrate digital texts or tools in literacy lessons could inform future professional development that effects the classroom practices of teachers. For example, research could include the following successive projects. Project 1: Investigate; How are teachers currently selecting and integrating digital text or tools for/during literacy lessons in their classrooms? Project 2: Provide targeted professional development in the areas identified as needs for both selection and integration. Project 3: Investigate; How do teachers' patterns of selection and integration change based on the provided professional development? This type of targeted,

successive development of teacher professional development could potentially result in increased teacher knowledge, and in turn might give rise to student outcomes.

Further, the findings from Teachers' Use of Informal Reading Inventory Data to Inform Comprehension Instruction (Baxa, in progress), demonstrates a need for professional development to increase teacher knowledge regarding the collection, scoring, determination of objectives based on IRI comprehension data and integration of those objectives into instruction. For example, teachers had differing strengths and needs as they collected, scored, used IRI data to inform objectives and taught comprehension objectives, thus suggesting a need for individualized professional development. A similar, successive project research agenda could address these needs. Project 1: Investigate; What are teachers' strengths and needs with regard to accurate collection and scoring of IRI comprehension data, identifying lesson objectives and providing appropriate instruction? Project 2: Provide targeted professional development regarding teachers' strengths and needs for collection, scoring, objective identification, and follow up instruction. Project 3: Investigate; How do patterns of collection, scoring, objective identification, and follow-up instruction using IRI comprehension data change after professional development? By targeting teachers' individual needs, their strengths and needs might be honed more quickly, this could result in better student outcomes.

In sum, my planned research agenda will build on existing research about teacher knowledge enacted prior to and during literacy instruction, which is important to improving teachers' practices (Puliatte & Ehri, 2017). The agenda will include addressing how to build 'considerable expertise' (IRA & NCTE, 2010, p. 14) for pedagogical-content knowledge (PCK), or technological pedagogical content knowledge (TPACK)

through a consecutive research project approach (Mishra & Kohler, 2006; Shulman 1986, 1987). I plan to focus on both teachers' knowledge regarding selecting and integrating digital text or tools and using IRIs to inform instruction as part of this agenda.

APPENDIX A
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IRB APPROVAL LETTERS

Heidi Johnson <no-reply@irbnet.org> Mon, Oct 12, 2015, 12:52 PM

to me

Please note that Oakland University IRB has taken the following action on IRBNet:

Project Title: [779301-2] Digital Literacy Integration
Principal Investigator: Tanya Christ, Ph.D.

Submission Type: New Project
Date Submitted: October 12, 2015

Action: APPROVED
Effective Date: October 12, 2015

OAKLAND UNIVERSITY

Institutional Review Board for the Protection of Human Subjects

DATE:	March 26, 2018
TO:	Julie Baxa
FROM:	Oakland University IRB
PROJECT TITLE:	Teachers' use of IRI Data to Inform Instruction
REFERENCE #:	1197351-1
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	March 26, 2018
EXPIRATION DATE:	March 25, 2019
REVIEW TYPE:	Expedited Review
REVIEW CATEGORY:	Expedited review category # 5, 6 and 7
IRB MEETING DATE:	April 26, 2018

Thank you for your submission of New Project materials for this project. The Oakland University IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission package includes the following approved documents:

- Application
- Consent Form Version 03/26/2018 which has been published as a Board Document under Reviews in IRBNet. **The IRB approved consent document MUST be used in recruitment and consent of participants in the research.**
- Assent Forms Version 03/26/2018 which have been published as a Board Document under Reviews in IRBNet. **The IRB approved assent document MUST be used in recruitment and consent of participants in the research.**
- Parental Permission Form Version 03/26/2018 which has been published as a Board Document under Reviews in IRBNet. **The IRB approved permission document MUST be used in recruitment and consent of participants in the research.**
- Interview Questions for Students
- Interview Questions for Teachers

This submission has received Expedited Review based on the applicable federal regulations.

Please remember that informed consent is a process beginning with a description of the project and assurance of participant understanding followed by a signed consent form. Informed consent must

continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate form(s) for this procedure. Do not collect data while the revisions are being reviewed. Data collected during this time cannot be used.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of March 25, 2019.

Please note that all research records including signed consent forms if applicable must be retained for a minimum of three years after the completion of the project.

Please retain a copy of this correspondence for your records.

If you have any questions, please contact Kate Wydeven M.S. at (248) 370-4306 or kwydeven@oakland.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Oakland University IRB's records.

APPENDIX B.

LETTER OF ACCEPTANCE FROM THE READING TEACHER FOR THE DIGILIT FRAMEWORK MANUSCRIPT

The Reading Teacher - Decision on Manuscript ID RT-2017-03-0048.R2

Reply | Reply All | Forward | ...

onbehalfof+rt+reading.org@manuscriptcentral.com
To jkbaxa@oakland.edu; dnjbaxa@comcast.net; christ@oakland.edu
Wed 9/20/2017 4:41 PM

Dear Julie Baxa:

Thank you for submitting RT-2017-03-0048.R2, "The DigiLit Framework." We are pleased to accept it in its current form for publication in The Reading Teacher. We appreciate the great care you took through the revision process--and we look forward to seeing you manuscript in the journal!

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Sincerely,

Robin Griffith and Jan Lacina
Editors, The Reading Teacher
International Literacy Association
rt@reading.org

APPENDIX C.

ADMINISTRATION OF THE BAS AND DRA2 COMPREHENSION SECTIONS

Teachers in this study administered either Benchmark Assessment System (BAS) (Fountas & Pinnell 2016) or Developmental Reading Assessment 2nd Edition (DRA2) (Beaver, 2006) per district implementation. The following section describes the administration procedures that teachers should follow during the administration of the BAS and DRA2 respectively. Clarity on these administration procedures will help the reader understand the results of this study as well as the implications for practice.

During the administration of BAS, the goal of the comprehension section is for the teacher to engage in a comprehension conversation with the student to gain "behavioral evidence of a child's understanding" (Fountas & Pinnell, 2016; Assessment Guide, p.25). The process is as follows: after the student reads the text the teacher uses an initial broad open-ended prompt to get the student to talk about their thinking. The prompt is "talk about what you learned in this book," or "talk about what happened in the story" (Fountas & Pinnell, 2011; Assessment Guide, p.25). Next, based on what the child has shared about their thinking, the teacher can use general open-ended follow-up prompts such as "Say more about that," "Tell more," or "What else?" (Fountas & Pinnell, 2011; Assessment Guide, p.25) to get the student to say more about their understanding. After the initial broad open-ended prompt, a list of "key understandings and prompts" is available for the teacher to ask which are categorized into Within the Text, Beyond the Text, and About the Text sections. The directions state that teachers should skip a question/prompt if the child has already given the answer to the question during the initial broad open-ended portion or as the child answered another question. The teacher is also encouraged to avoid asking questions that may "lead" a child to an answer (Fountas & Pinnell, 2011; Assessment Guide, p.26). Children can go back into the text to search;

however, this action must be student-initiated. Teachers should not suggest that a child go back and look at the text unless a specific question prompts the teacher to do so.

During the administration of the DRA2, the teacher gives an initial broad open-ended prompt that asks the student to retell the story using the prompt, "Start at the beginning, and tell me what happened in the story." The student should complete the retelling without the support of the text. The teacher can choose from several open-ended prompts to gain further information from the child, if needed. These prompts include, "Tell me more." "What happened at the beginning?" "What happened before/after _____?" "Who else was in the story?" and "How did the story end?" The teacher can continue to use these prompts, until the student has shared all that they can from the text. The directions state that teachers should not ask any other questions (DRA 2 teacher Guide, p. 50). Additionally, teachers ask children Reflection, Making Connections, and/or Interpretation questions following the retelling.

APPENDIX D.

SEMI-STRUCTURED TEACHER INTERVIEW QUESTIONS AFTER IRI ADMINISTRATION

Demographic Information

What is your gender?

What is your age?

What is your race?

1. In what grade(s) do you teach reading?
2. For how many years have you been teaching?
3. How many times a year do you administer the IRI?
4. Please describe how you use the IRI data.
5. What kinds of professional development have you received related to IRIs:
6. What did you learn about Student A as a reader during your administration of the IRI?

   Based on the answer ask about Needs? Other needs? Other needs? Until all answers have been exhausted and then move on to Strengths? Other strengths? Other strengths? Until all answers have been exhausted

7. What in the assessment data helped you know... (discuss specific strengths and needs that the teacher discussed in question 1)?
8. What do you plan to do with this information?
9. What else would you like to tell me about your IRI with this student that I have not asked yet?

Repeat questions for additional students (Student B and Student C)

APPENDIX E.

INTERVIEW QUESTIONS TO BE ASKED AFTER TWO SUBSEQUENT READING LESSONS

(Discuss each focal student's first and second lesson before moving to the next focal student's lessons- as much as possible)

1. Tell me about your first reading lesson with Student A.
2. Tell me about how you chose the objective for your lessons for Student A.
3. Tell me about your choices for your lesson for example, the book you chose, the materials you chose, and your instruction, for your first lesson with Student A. Possible follow up questions: What went well during the lesson? What did not go as expected or as well as you might have wished during the lesson? What evidence from the lesson makes you think this?

4.I noticed you did… Can you tell me more about that?

5.Tell me about your second reading lesson for Student A.

6. Tell me about how you chose the objective for your second lesson for Student A?
7. Tell me about your choices for your lesson for example, the book you chose, the materials you chose, and your instruction, for your second lesson with Student A? Possible follow up questions: What went well during the lesson? What did not go as expected or as well as you might have wished during the lesson? What evidence from the lesson makes you think this?
8. I noticed you did… Can you tell me more about that?

Repeat questions for Student B and Student C.

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