High school teachers' disciplinary literacy knowledge: a mixed-method study

Paula Di Domenico

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ABSTRACT

HIGH SCHOOL TEACHERS’ DISCIPLINARY LITERACY KNOWLEDGE: A MIXED-METHOD STUDY

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Northern Illinois University, 2014
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This mixed-methods study examines the disciplinary-literacy knowledge that high school English, mathematics, science, and social studies teachers possess and the knowledge and skills on which they rely when planning for instruction. Three hundred and eleven high school teachers completed a survey that measured high school teachers’ disciplinary-literacy knowledge; four teachers who completed the survey also participated in a think-aloud of unit design and a semistructured interview. Quantitative data were analyzed via descriptive statistics, factor analysis, a one-way multivariate analysis of variance [MANOVA], and post-hoc tests. Qualitative data were analyzed using three cycles of coding: descriptive codes, axial codes and frequency counts, and assertion development. All analyses were merged to determine the knowledge high school teachers possess and the knowledge they utilize when planning for instruction. Through this analysis, a theory of teachers’ application of knowledge to planning process emerged, and a framework for a multisystems approach to professional development was identified as an avenue to bridge reform and teacher practice. Suggestions for inservice professional-development providers and preservice teacher educators are also offered.
HIGH SCHOOL TEACHERS’ DISCIPLINARY LITERACY KNOWLEDGE: A MIXED-METHOD STUDY

BY

PAULA DI DOMENICO

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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF EDUCATION

DEPARTMENT OF LITERACY AND ELEMENTARY EDUCATION

Doctoral Director:

Laurie Elish-Piper
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DEDICATION

To Elizabeth,

for your inspirational demonstration of what it means
to fight for an education, humbly and passionately
TABLE OF CONTENTS

LIST OF TABLES.................................................................................................................. ix
LIST OF FIGURES ................................................................................................................. xi
LIST OF APPENDICES .......................................................................................................... xii

Chapter
1. INTRODUCTION .............................................................................................................. 1
   Conceptual Framework .................................................................................................. 5
   Discourse Communities .............................................................................................. 5
   Domain Knowledge .................................................................................................... 6
   Disciplinary Literacy .................................................................................................. 7
   Statement of the Problem ......................................................................................... 8
   Research Questions ................................................................................................... 9
   Significance of the Study .......................................................................................... 10
   A Priori Limitations ................................................................................................. 11
   Delimitations ............................................................................................................ 12
   Definitions of Terms ................................................................................................ 12
   Methodology .............................................................................................................. 13
   Organization ............................................................................................................... 14
2. REVIEW OF THE LITERATURE .................................................................................. 15
   Conceptual Framework .............................................................................................. 15
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discourse Communities</td>
<td>16</td>
</tr>
<tr>
<td>Domain Knowledge</td>
<td>17</td>
</tr>
<tr>
<td>Disciplinary Literacy</td>
<td>19</td>
</tr>
<tr>
<td>The Nature of Expertise</td>
<td>22</td>
</tr>
<tr>
<td>Expert-Novice Studies</td>
<td>25</td>
</tr>
<tr>
<td>Discipline-Specific Literacies</td>
<td>30</td>
</tr>
<tr>
<td>English/Language Arts</td>
<td>31</td>
</tr>
<tr>
<td>Mathematics</td>
<td>34</td>
</tr>
<tr>
<td>Science</td>
<td>37</td>
</tr>
<tr>
<td>Social Studies</td>
<td>41</td>
</tr>
<tr>
<td>Preservice Teacher Preparation</td>
<td>44</td>
</tr>
<tr>
<td>Professional Development for Inservice Teachers</td>
<td>45</td>
</tr>
<tr>
<td>Conclusion</td>
<td>48</td>
</tr>
<tr>
<td>3. METHODOLOGY</td>
<td>49</td>
</tr>
<tr>
<td>Research Design</td>
<td>49</td>
</tr>
<tr>
<td>Population and Sample</td>
<td>51</td>
</tr>
<tr>
<td>Data Collection</td>
<td>53</td>
</tr>
<tr>
<td>Instrument Development</td>
<td>54</td>
</tr>
<tr>
<td>Instrument Pilot</td>
<td>57</td>
</tr>
<tr>
<td>Survey</td>
<td>59</td>
</tr>
<tr>
<td>Think-Aloud Protocol and Semistructured Interviews</td>
<td>59</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>61</td>
</tr>
<tr>
<td>Survey</td>
<td>61</td>
</tr>
</tbody>
</table>
Chapter 4: RESULTS

Data Analysis .................................................................................................................. 67
  Descriptive Statistics ...................................................................................................... 68
  Factor Analysis ................................................................................................................ 75
  Descriptive Statistics by Factor and by Discipline ....................................................... 79
  Results of MANOVA ...................................................................................................... 91
  Post-Hoc Tests ................................................................................................................ 96

Qualitative Data Analysis .................................................................................................. 98
  Trustworthiness ............................................................................................................. 102
  Participant Overview ................................................................................................... 103
  Assertions ...................................................................................................................... 107
  Habits of Thinking ....................................................................................................... 132

Chapter 5: SUMMARY AND CONCLUSIONS ..................................................................... 136

Discussion of Findings ..................................................................................................... 138
  High School Teachers’ Disciplinary-Literacy Knowledge ............................................. 140
  High School Teachers’ Knowledge as Compared to the Experts in the Expert-Novice Studies .................................................................................................................................................. 145
  Knowledge Teachers Rely on When Planning Lessons for Instruction ......................... 152
  Teachers’ Planning as Impacted by Their Knowledge of and Access to Curricular Guidelines .................................................................................................................................................. 152
Teachers’ Use of Text and Text Selection as Dependent upon Their Own Knowledge of Resources and Their Sources of Curriculum ................................................. 155
Teachers’ Choice of Text as Influenced by Their Own Interactions with Texts .............................................................................................................................. 158
Teachers Instructional Goals as Based on Their Identified Assessments .......... 160
Teachers Reliance on Complex Skills When Designing Units for Instruction ................................................................................................................................. 162
Implications .................................................................................................................. 164
Limitations ..................................................................................................................... 175
Future Research ............................................................................................................ 177
Final Thoughts ............................................................................................................... 178
REFERENCES ............................................................................................................... 182
APPENDICES ............................................................................................................... 191
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Descriptive Statistics of Survey Items, Section 1: Teachers’ Views of Texts and Authors</td>
<td>69</td>
</tr>
<tr>
<td>2.</td>
<td>Descriptive Statistics of Survey Items, Section 2: Teachers’ Use of Strategies to Make Sense of Texts</td>
<td>70</td>
</tr>
<tr>
<td>3.</td>
<td>Descriptive Statistics of Survey Items, Section 3: Teachers’ Consideration When Planning for Instruction</td>
<td>71</td>
</tr>
<tr>
<td>4.</td>
<td>Descriptive Statistics of Survey Items, Section 4: Teachers’ Confidence in Students’ Ability to Engage in Habits of Thinking</td>
<td>69</td>
</tr>
<tr>
<td>5.</td>
<td>Pattern/Structure Coefficients: Varimax Rotation of Six-Factor Solution for High School Teachers’ Disciplinary-Literacy Knowledge</td>
<td>75</td>
</tr>
<tr>
<td>6.</td>
<td>Parallel Analysis</td>
<td>78</td>
</tr>
<tr>
<td>7.</td>
<td>Factor 1: Teachers’ Views of Students’ Abilities to Engage in Habits of Thinking</td>
<td>81</td>
</tr>
<tr>
<td>8.</td>
<td>Means by Discipline for Factor 1: Teachers’ Views of Students’ Abilities to Engage in Habits of Thinking</td>
<td>82</td>
</tr>
<tr>
<td>9.</td>
<td>Factor 2: Teachers’ Views of Authors and Texts</td>
<td>85</td>
</tr>
<tr>
<td>10.</td>
<td>Means by Discipline for Factor 2: Teachers’ Views of Authors and Texts</td>
<td>86</td>
</tr>
<tr>
<td>11.</td>
<td>Factor 3: Teachers’ Confidence in Teaching Habits of Thinking</td>
<td>87</td>
</tr>
<tr>
<td>12.</td>
<td>Means by Discipline for Factor 3: Teachers’ Confidence in Teaching Habits of Thinking</td>
<td>88</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>13.</td>
<td>Factor 4: Teachers’ Use of General Strategies</td>
<td>89</td>
</tr>
<tr>
<td>14.</td>
<td>Means by Discipline for Factor 4: Teachers’ Use of General Strategies</td>
<td>89</td>
</tr>
<tr>
<td>15.</td>
<td>Factor 5: Teachers’ Interactions with Texts</td>
<td>90</td>
</tr>
<tr>
<td>16.</td>
<td>Means by Discipline for Factor 5: Teachers’ Interactions with Texts</td>
<td>90</td>
</tr>
<tr>
<td>17.</td>
<td>Demographic Data by Discipline</td>
<td>92</td>
</tr>
<tr>
<td>18.</td>
<td>Results of MANOVA by Factor</td>
<td>95</td>
</tr>
<tr>
<td>19.</td>
<td>Frequency Counts</td>
<td>131</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Teaching on the diagonal</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Alignment of research questions with data collection instruments/strategies</td>
<td>50</td>
</tr>
<tr>
<td>3.</td>
<td>Summary of survey constructs and sample items</td>
<td>53</td>
</tr>
<tr>
<td>4.</td>
<td>Scree plot</td>
<td>73</td>
</tr>
<tr>
<td>5.</td>
<td>Codes and examples of idea units</td>
<td>95</td>
</tr>
<tr>
<td>6.</td>
<td>Summary of participants</td>
<td>101</td>
</tr>
<tr>
<td>7.</td>
<td>A model of teachers’ application of knowledge to the planning process</td>
<td>155</td>
</tr>
<tr>
<td>8.</td>
<td>Multisystem framework for professional development</td>
<td>158</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. EMAIL TO SURVEY PARTICIPANTS</td>
<td>192</td>
</tr>
<tr>
<td>B. THINK-ALOUD PROTOCOL CONSENT FORM</td>
<td>194</td>
</tr>
<tr>
<td>C. IRB APPROVAL</td>
<td>198</td>
</tr>
<tr>
<td>D. ONLINE SURVEY MEASURING TEACHERS’ DISCIPLINARY-LITERACY KNOWLEDGE</td>
<td>202</td>
</tr>
<tr>
<td>E. THINK-ALOUD PROTOCOL</td>
<td>208</td>
</tr>
<tr>
<td>F. SEMI-STRUCTURED INTERVIEW QUESTIONS</td>
<td>211</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

Literacy skills are essential for college and career readiness and are vital to the development of an economically competitive workforce. In 2005, over half of the students who took the ACT were not college and career ready (American College Testing [ACT], 2006). Thus, it is not surprising that educational policies (No Child Left Behind Act [NCLB], 2003; Race to the Top Act, 2011) are focused on reforming education in an attempt to improve student achievement. Despite this focused attention, adolescents’ literacy rates remain stagnant (ACT, 2006; National Center for Education Statistics [NCES], 2010). Though recent reforms attempt to address students’ literacy rates, teachers’ readiness to enact these reforms should be considered as the interaction between students and teacher and the main determinant of successful educational reform (U.S. Department of Education, 2010).

The Common Core State Standards (CCSS) are one such reform attempting to foster students’ literacy and numeracy skills in an effort to ensure that students are college and career ready. The CCSS were adopted in over 40 states (National Governors Association Center for Best Practices [NGA] & Council of Chief State School Officers [CCSSO], 2010). These standards require a discipline-specific literacy focus in all content areas and
clarify that both reading and writing skills should be taught in each content area in a manner attentive to the norms and conventions of the disciplines (NGA Center & CCSSO, 2010).

For example, the standards for literacy in history/social studies require students to “Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information” (CCSSO, 2010, p. 61). This focus on the context of an historical document as well as the document’s author is a practice that is a norm of the discipline of history (Shanahan, Shanahan, & Misischia, 2011; Wineburg, 1991). The CCSS not only present the expectation of a disciplinary-literacy approach to instruction, but they are also the foundation for the assessments that measure student achievement (Conley, 2012). In effect, these standards dictate a shift from content area literacy, or using generic literacy strategies to help students access content, towards a focus on discipline-specific instruction and strategies. Attention to teacher professional development in these areas is necessary as professional development is crucial to render these higher standards meaningful and attainable (U.S. Department of Education, 2010).

Concurrent with these reforms, a disciplinary-literacy approach to instruction is considered in the field of literacy research as an avenue to provide high school students with support to develop literacy in the disciplines because the more complex literacy demands at the high school level necessitate specialized instruction and strategies (Fang, 2012a; Fang & Schleppegrell, 2010; Lee & Spratley, 2010; Moje, 2008; Shanahan & Shanahan, 2008; 2012). The goal of a disciplinary-literacy approach is to focus on discipline-specific literacy skills and processes valued by the discipline in an attempt to
improve high school students’ literacy achievement (Moje, 2008; Shanahan & Shanahan, 2008; 2012).

The construct of disciplinary literacy relies on the premise that high school teachers are experts in the discipline they teach and can attend to and directly instruct the conventions and norms of that discipline. Nevertheless, there is a dearth in the literature on high school teachers’ disciplinary-literacy knowledge; current research in disciplinary literacy focuses on the norms and conventions that experts in the field, not high school teachers, employ.

The experts who were consulted in the expert-novice studies from which this information is drawn are professors, doctoral candidates, and others who hold terminal degrees in the field (e.g., Shanahan et al., 2011; Wineburg, 1991). Because high school teachers have not yet participated in expert-novice studies, it is unclear whether teachers possess the domain knowledge necessary to apprentice their own students effectively to the discipline. Moreover, assumptions that high school teachers utilize the same skills and processes as experts in the field are problematic. This is because experts and novices rely on different literacy skills as they participate in different literacy tasks for different purposes (Geisler, 1994). For example, novices write for the purpose of summarizing knowledge, but experts write for the purpose of adding to the body of knowledge in the discipline (Geisler, 1994). Without an understanding of how teachers interact with text in the discipline, it is unclear whether they participate in the discipline as novices or experts or at some level between these two. Thus, high school teachers may or may not utilize the habits of thinking that the experts in these studies employ.
Research suggests that in order to implement disciplinary-literacy practices effectively, teachers need to be able to teach on the diagonal (McConachie, 2010; Shanahan & Shanahan, 2008). The premise behind teaching on the diagonal, as represented in Figure 1, requires the habit of thinking in the discipline to learn the content of the discipline in a manner that increases in complexity over time (McConachie, 2010). Thus, a high school teacher would be required to possess and utilize content knowledge as well as disciplinary-literacy knowledge, or knowledge of the habits of thinking in the discipline.

**Figure 1.** Teaching on the diagonal (McConchie, 2010, p. 23).

Although content area knowledge involves having knowledge of the concepts and principles essential to the domain, disciplinary-literacy knowledge involves teachers being aware of and able to teach the habits of thinking and norms and conventions for reading, writing, speaking, and listening in the domain. Thus, an investigation into high school teachers’ domain knowledge is warranted as there is currently a dearth in the literature regarding what degree of disciplinary-literacy knowledge high school teachers possess.
This knowledge provides insight into preservice teacher educators and professional-development providers as they collaborate with preservice and inservice teachers to enact educational reforms geared toward adolescents’ literacy development in the disciplines.

**Conceptual Framework**

This study is based on the premise that individuals are members of Discourse communities and that members of these communities have both domain knowledge and disciplinary-literacy practices that they value. The concepts of Discourse communities, domain knowledge, and disciplinary literacy are described briefly in this introduction; a more detailed explanation of this framework is found in Chapter 2.

**Discourse Communities**

The first concept that helps to shape this study is that of Discourse communities. Discourse communities are groups of people who have shared language, actions, interactions, ways of thinking, and values that are agreed upon by the group and are often tacit (Gee, 2005). Discourse communities include more than the language-in-action used by speakers to enact activities and identities, which is known as discourse. Gee (2005) differentiates between “big D” Discourse and “little d” discourse. Little-d discourse refers to the use of language. On the other hand, big-D Discourse refers to both the use of language (little-d discourse) and the connected social practices that allow one to engage in that Discourse community. In this study, the focus is on the Discourse communities to
which people belong, as this includes more than just their discourse and includes ways of acting, interacting, and feelings, beliefs, and values (Gee, 2005).

When one considers this definition of Discourse communities, it is important to note that people could conceivably belong to several Discourse communities. Specifically, teachers in high schools could be members of any number of Discourse communities. For example, a biology teacher may be a member of a Discourse community of science teachers, a Discourse community of biologists, or a Discourse community of educators. Additionally, this biology teacher may belong to all of these Discourse communities. Regardless of the actual community to which a teacher belongs, the teacher’s values, language, and actions are based on those which the community values. It is these values that impact the knowledge and the processes that are respected and thus taught. Knowledge of these values facilitates domain knowledge acquisition.

**Domain Knowledge**

Domain knowledge is the second concept that shapes this study. For the purposes of this study, the focus is on two types of domain knowledge: content knowledge (Shulman, 1986) and disciplinary-literacy knowledge (Shanahan & Shanahan, 2008) as these are requisite to teaching on the diagonal. To be clear, a domain is defined as the content of a particular field, and having domain knowledge involves knowing the declarative, procedural, and conditional knowledge that is tacit or explicit (Alexander & Judy, 1988) to that particular field. For example, a math teacher has domain knowledge if he or she applies knowledge of symbols and mathematical structure to solve a problem.
Teachers who can teach on the diagonal have tacit knowledge about the content, the procedures, and when and how this knowledge is used in their particular discipline. They also have knowledge of disciplinary literacy or the habits of thinking valued by the community of that discipline. This awareness of the habits of thinking in a domain is disciplinary literacy.

**Disciplinary Literacy**

The third concept that frames this study is disciplinary literacy. Disciplinary literacy is based on the premise that as “academic subject matter becomes more complex and differentiated by disciplines, so must the definition of literacy” (McConachie, 2010, p. 15). In fact, in order to gain deep conceptual knowledge on a topic, one must focus on the habits of thinking in which experts in the discipline engage (McConachie, 2010) and place emphasis on the knowledge and abilities possessed by those who “create, communicate, and use knowledge within the discipline” (Shanahan & Shanahan, 2012, p. 8). These ways of knowing that are central to the premise of disciplinary literacy are based on the norms and conventions of the Discourse communities represented by the disciplines. Taken together, the concepts of Discourse communities, domain knowledge, and disciplinary literacy serve as the foundation of this study as each contribute to the knowledge base necessary to teach students effectively the habits of thinking of the disciplines and Discourse communities to which teachers belong.
Statement of the Problem

To determine the discipline-specific literacy skills required in each Discourse community, researchers are working to identify the disciplinary-literacy practices that lead to successful learning in the discipline (e.g., Shanahan et al., 2011; Wineburg, 1991). This research is meant to identify the strategic behaviors in which the experts engage as they are interacting with text. The ultimate goal of this research is to build strategies based on the behaviors used by experts so that those behaviors can be taught to high school students and other apprentices to the discipline. By observing the ways in which experts successfully interact with texts, strategies can be modeled to serve as scaffolds for students as they are apprenticed to the discipline.

Nevertheless, high school teachers’ knowledge has not been assessed to determine whether or not they themselves share the habits of thinking utilized by the experts in their respective fields. That is, currently, there is no information on the ways in which high school teachers from various disciplines interact with the texts in their disciplines. Thus, it is unclear whether or not teachers are able to scaffold students’ ability to learn to think as experts in the field. This is especially significant because expertise often does not develop until late in the undergraduate career or even graduate school (Geisler, 1994), so teachers who do not have advanced degrees in the disciplines may not yet have developed expertise, partly because the tasks in which novices engage are different from the tasks in which experts engage (Geisler, 1994).

Expert-novice studies that focus on how doctoral candidates or scholars with Ph.Ds. interact with text in the discipline contribute to the growing body of disciplinary-literacy
knowledge (e.g., Shanahan et al., 2011; Wineburg, 1991). It is on these experts’ habits of thinking that the current disciplinary-literacy strategies are modeled. The habits of thinking on which high school teachers rely have not yet been explored, so it remains uncertain whether or not teachers and experts share habits of thinking.

The habits of thinking that experts utilize in their respective fields are supported by content knowledge and disciplinary-literacy knowledge. Therefore, it is important to investigate whether or not teachers possess this knowledge in order to determine if they are able to incorporate disciplinary-literacy practices into their instruction. If teachers do not possess the skills and strategies and/or an understanding of how knowledge is created in the discipline, it becomes difficult if not impossible for these teachers to model this thinking for students. Thus, an investigation into the types of domain knowledge teachers possess is necessary and relevant. The purpose of this study is to investigate the type of domain knowledge high school teachers of English/language arts, mathematics, science, and social studies possess, as well as what knowledge domains they utilize when planning a unit for instruction.

Research Questions

The following research questions guided this study:

1. What type(s) of domain knowledge do high school teachers in four Discourse communities (English/language arts, mathematics, science, and social studies) possess?
2. Which knowledge domain(s) do high school English/language arts, mathematics, science, and social studies teachers draw upon when planning for instruction, as demonstrated by a think-aloud of lesson construction?

3. How do high school English/language arts, mathematics, science, and social studies teachers use domain knowledge when planning for instruction?

Together, these research questions investigate high school teachers’ disciplinary-literacy knowledge as well as the knowledge and the skills they rely on when planning units for instruction.

Significance of the Study

The findings from this study can inform those who develop curriculum, preservice teacher educators, and professional-development providers, including literacy coaches. The findings can also add to the research base of teacher knowledge and disciplinary literacy.

In order to develop curriculum for teacher preparation programs, it is necessary to understand the type of knowledge teacher candidates possess and the knowledge they need to be successful in implementing discipline-specific literacy instruction into their courses (Shanahan & Shanahan, 2008). Findings from this study can also add to the field as they identify the knowledge inservice teachers possess and rely on as they plan for instruction. This information can provide insight into the type of professional development these teachers may need in order to fully implement the CCSS and provide students with discipline-specific literacy instruction.
Although it is ideal to pair a literacy professional and a disciplinary expert together to create lessons that incorporate discipline-specific literacy instruction for high school students (Shanahan, 2012a), it is difficult for the literacy professional to determine the level of knowledge the teacher has in terms of the habits of thinking in the discipline. Insights into the knowledge that these teachers have and need could facilitate effective collaborations between teachers and literacy coaches, especially as they work to help teachers incorporate discipline-specific literacy instruction, as required by the NGA Center and CCSSO (2010).

A Priori Limitations

Methodological limitations are present in this study. First, although the sample size for the survey is robust and represents the population of teachers from the Northern Illinois region adequately, the sample size for the think-aloud protocols and the semistructured interviews was limited to four participants. Thus, caution should be taken when attempting to generalize findings from the semistructured interviews and think-aloud protocols. Further, results of analysis of the survey responses are also limited to those who taught in the northern region of Illinois. Future research could investigate teachers’ knowledge using a broader sample. Another limitation of the study is that the reporting of teachers’ knowledge relies on self-reported data with regard to their disciplinary-literacy knowledge. The think-aloud and semistructured interview were conducted in an attempt to corroborate the knowledge teachers report to possess; teachers may report, for example, that they do consider the context when interpreting text but not actually engage in this thinking when
they are interacting with text. An examination of teachers’ interactions with text was not part of this study. Though methodological limitations are present in this study, analysis of the data collected in this study provides insight into teachers’ knowledge and the practices in which they engage when planning for instruction.

**Delimitations**

This study is limited to high school teachers in four disciplines—English/language arts, mathematics, science, and social studies—who teach in public high schools in the northern region of Illinois.

**Definitions of Terms**

- **Content-area literacy** is general literacy instruction that can be applied across all content areas (Faggella-Luby, Graner, Deshler, & Drew, 2012).

- **Content knowledge** is the amount and organization of knowledge in the mind of a teacher that is related to the subject matter he/she teaches (Shulman, 1986).

- **Disciplinary literacy** is “knowledge of how information is created, shared, and evaluated, as well as an awareness of the nature of the conceptual ‘lenses’ employed by disciplinary experts and the implications of these epistemological tools” (Shanahan et al., 2011, p. 396).

- **Discourse community** is the shared language use and social practices of a particular group (Gee, 2005). For example, a group of English/language arts teachers describing the social implications of novels written in the post-modern era would qualify as a Discourse
community as their discourse (about the novel and its impact) and their approach to literary
discussion, including what they value and what informs the ways in which they act and
construct meaning from both the text and the discussion itself.

Domain is a field of study (e.g., biology) (Alexander & Judy, 1988).

Domain knowledge is the declarative, procedural, and conditional knowledge in a
domain (Alexander & Judy, 1988).

Expertise is “more than competence” in a domain (Geisler, 1994, p. 53) and
consists of an understanding of how knowledge is constructed in a field (Geisler, 1994).

Methodology

A convergent, mixed-method study was employed to investigate the domain
knowledge teachers possess and rely on when planning for instruction. Participants include
high school teachers who were certified in and currently teaching English/language arts,
mathematics, science, or social studies. Teachers who fit this criteria and who were
teaching in the northern region of Illinois were asked to complete a survey, and four of
these teachers, one from each of the four disciplines, were asked to complete a think-aloud
protocol (Ericsson & Simon, 1980) designed to gain insight into the knowledge domains
and skills teachers rely on when planning for instruction. After the think-aloud, these
teachers also participated in a semistructured interview that provided a platform for these
teachers to reflect on their planning and served to provide more detailed information about
their practice.
Survey data were collected through SurveyMonkey and downloaded to SPSS for analysis. Descriptive statistics were calculated. A factor analysis and a one-way multivariate analysis of variance (MANOVA) were also conducted to determine the type of knowledge possessed by teachers in each discipline. After member-checking to ensure accuracy, each transcribed think-aloud and interview was coded in three cycles. The first cycle utilized descriptive coding (Wolcott, 1994). The second cycle included axial coding (Charmaz, 2006) and frequency counts (LeCompte & Schensul, 1993). Finally, assertions were developed based on both the coded transcripts and analytic memos drafted during each cycle. These assertions underwent peer review prior to final analysis (Saldana, 2009).

Organization

Information presented in this study is organized into five chapters. The first chapter provides an introduction to the study. In Chapter 2, relevant literature is reviewed and synthesized within the conceptual framework. The methodology is described in detail in Chapter 3. In Chapter 4, the findings are presented. A discussion of the findings, implications, and areas for future research are explored in Chapter 5.
CHAPTER 2
REVIEW OF THE LITERATURE

The definition of literacy and what constitutes a literate person is continually evolving (Geisler, 1994), as are educators’ responses to students’ shifting literacy needs. The purpose of this review of the literature is to examine the current context surrounding disciplinary literacy and the expert-novice studies that shape what it means to provide a discipline-specific approach to literacy instruction. This review begins with a discussion of the conceptual framework that shapes this study and then presents the literature related to expertise, the expert-novice studies, and the demands of the disciplines.

Conceptual Framework

The concepts of Discourse communities, domain knowledge, and disciplinary literacy frame this study. This study is based on the premise that individuals are members of Discourse communities and that in order to be a member of these Discourse communities, one must not only have domain knowledge but have knowledge of the disciplinary-literacy practices that are valued within the discipline. Thus, these concepts are explored thoroughly.
Discourse Communities

The first concept that shapes this study is Discourse communities. Although Discourse communities have shared discourse, or language, Gee (2005) defines “Discourse communities” as groups of people who share discourse, actions, interactions, and ways of thinking that are tacit and agreed upon by the group. The various content areas in high schools can be viewed as Discourse communities as the subject areas “validate different forms of knowledge and processes, including literacy processes, validated for accessing and using knowledge in a particular group” (O’Brien, Stewart, & Moje, 1995, p. 449). Thus, in a high school, teachers may be members of several Discourse communities. That is, a social studies teacher may be a member of a Discourse community of high school teachers, of high school social studies teachers, of U.S. historians, or of European historians, as membership in the group depends on whether or not they share the tacit values and knowledge agreed upon by that group (Gee, 2005).

Within these groups, language serves two functions. The first is to support the social activities valued by the group, and the second is to support one’s affiliation within the group (Gee, 2005). Gee explains that although membership is not focused solely on members’ use of language, it is the entry point into the Discourse community. That is, Discourse communities shape literacy processes and also shape what is valid for accessing and using knowledge within that group (O’Brien et al., 1995). Thus, an individual’s membership in these communities shapes his or her views and values, which, in high school Discourse communities, influences decision-making about what information is taught and how that information is taught to students.
One further distinction of a Discourse community is that members of the community possess knowledge that is tacit. There are two characteristics of tacit knowledge. One is that this knowledge can be gained only through first-hand experience from experts in the discipline, and the other is that the passage of the knowledge from one person to another is invisible (Geisler, 1994). Thus, it can be difficult to determine whether or not an individual is a member of such a community and whether that individual possesses the tacit knowledge valued by the group.

Because it is the literacy of the discipline that permits entry into the community, members of Discourse communities require both domain knowledge and disciplinary-literacy knowledge to belong to the community. It is clear that one must have knowledge of the domain; it is also important that one is aware of the process of consuming and producing this domain knowledge as well. That is, each discipline has its own values and manner of both producing and consuming knowledge; it is this knowledge that allows one access to the Discourse community (Moje, 2008).

**Domain Knowledge**

Teachers can be members of Discourse communities in their disciplines if they possess domain knowledge. Alexander (1992) defines domain knowledge as “a specialized instance of an individual’s existing conceptual knowledge that is related to a specific ‘studied’ area” (p. 35). To have this domain-specific knowledge, one requires three types of knowledge. The first is declarative or the factual information in the domain. The second is procedural meaning knowledge of how to enact domain-specific strategies. Finally, the
third type of knowledge is conditional knowledge, which involves knowing when and where to use the strategies that are specific to the domain (Alexander & Judy, 1988). This knowledge is essential in high school Discourse communities of teachers because those who know more about a particular domain understand it better and teach it better than those who do not (Alexander & Judy, 1988).

To possess domain knowledge, one must have subject matter knowledge, or general knowledge about the specific domains, topic knowledge, and knowledge of the principles or fundamental concepts that distinguish it from others (Alexander, Jetton, & Kulikowich, 1995). Teachers in high schools may have varied types and levels of domain knowledge.

In fact, Shulman (1986) identifies three possible types of domain knowledge that teachers might possess. These include subject-matter knowledge, pedagogical-content knowledge, and curricular knowledge. Subject-matter knowledge is the amount and organization of knowledge in the mind of the teacher, and pedagogical-content knowledge is defined as the content and its teachability. This includes preconceptions that students of various ages and backgrounds bring with them to the learning. Finally, curricular knowledge is defined as the knowledge of the ways in which this instruction is planned and the ways the teacher draws on the tools to teach the content and the materials.

Thus, those who agree with Shulman’s (1986) work would concur that in order to have domain knowledge and teach effectively in a discipline, teachers require content knowledge, pedagogical content knowledge, and curricular knowledge (Moje, 2007). Nevertheless, to meet society’s increasing literacy demands, including those of disciplinary
literacy, teachers must also possess knowledge of the rhetorical processes utilized in the discipline.

**Disciplinary Literacy**

The third concept that shapes this study is disciplinary literacy. Shanahan and Shanahan (2012) explain that disciplinary literacy is drawn from the foundations created by content-area literacy. O’Brien et al. (1995) define content-area literacy as a focus on integrating reading and writing across the curriculum. Instead of providing developmental reading classes only for those who struggle, content-area literacy focuses on developing literacy processes in all secondary content-area classrooms. Nevertheless, shifts in instruction to include content-area literacy were largely absent as many content-area teachers did not value this type of instruction and viewed the use of generic literacy tools as redundant (O’Brien et al., 1995).

Disciplinary literacy began as a response to the lack of success of content-area literacy. To be clear, the difference between disciplinary literacy and content-area literacy is that disciplinary literacy has the goal of uncovering and teaching the discipline-specific practices in the domain that are not generalizable (Shanahan & Shanahan, 2008), but content-area literacy has the goal of uncovering and teaching general strategies that can be applied universally to access content (Fagella-Luby et al., 2012). Although students who struggle require generic approaches to literacy instruction in the content areas, all students require disciplinary-literacy instruction. Thus, the focus on disciplinary-literacy instruction does not replace content literacy instruction for students who struggle (Brozo, Moorman,
Meyer, & Stewart, 2013); rather, its aim is to teach students of all abilities how to interact with the texts in the discipline. This is essential as content-area strategies can help students who struggle, but they do not help students learn how to change their reading stances as they read texts in various disciplines (Warren, 2013).

Shanahan and Shanahan (2012) explain that a disciplinary-literacy approach “emphasizes the specialized knowledge and abilities possessed by those who create, communicate, and use knowledge within each of the disciplines” (p. 7). They argue that this advanced literacy instruction embedded within content areas should be a focus in middle and high school settings because, as learning becomes more complex, it becomes more difficult to generalize learning across disciplines.

A disciplinary-literacy approach to instruction is also important because disciplines are distinguished by language differences and a reader’s awareness of the author (Shanahan & Shanahan, 2008). In fact, disciplinary discourses utilize distinct language patterns that enable the experts to conduct their work on the content area (Fang, 2012a). When outsiders are taught how to recognize these patterns, they learn how language is used in the discipline and what language is valued. When students have mastered these patterns, they can interact within the texts of the discipline more successfully (Fang, 2012a).

This idea of teaching students both the content and the process of the discipline is referred to as “teaching on the diagonal” (McConachie, 2010). That is, in order to deeply engage with and learn content in a discipline, one must not only know the content but must also be aware of and engage in the “habits of thinking” valued by that discipline. This means that students must be learning both the content and the processes to access that
content simultaneously, with both aspects increasing in complexity as they advance in school. This approach requires teachers to have both domain knowledge (knowledge of the content) and disciplinary-literacy knowledge (knowledge of the process) (McConachie, 2010).

As is evident by the CCSS expectation that teachers attend to the values and norms of the disciplines (NGA Center & CCSSO, 2010), it is clear that teachers need to be able to teach not only the domain knowledge of the discipline but also the specific “reading and writing [instruction] to an extent greater than has been recognized by teachers or teacher preparation programs” (Shanahan et al., 2011, p. 395). Thus, it is essential to investigate the type of knowledge teachers possess to determine whether or not they are members of the Discourse communities of the subjects they teach. That is, it is important to determine whether teachers have both the tacit domain knowledge and disciplinary-literacy knowledge necessary to help students learn on the diagonal as studies have shown that students can engage in learning on the diagonal when given the opportunity to do so (e.g., Manderino, 2012; Monte-Santo, DeLaPaz, & Felton, 2014).

A disciplinary-literacy approach to instruction is being informed currently by expert-novice studies to determine how one should interact with text, based on the ways in which the experts engage with text. Thus, to understand completely the construct of disciplinary literacy, it is essential to review the nature of expertise as the expert-novice studies are shaping the disciplinary-literacy knowledge base.
The Nature of Expertise

In order to understand disciplinary literacy, one must first understand how the knowledge base was constructed for this disciplinary-literacy approach to instruction. Because a disciplinary-literacy approach to instruction is based on expert-novice studies, it is important to begin by defining what is meant by expertise, thus identifying those who would qualify to serve as the disciplinary experts in these studies.

In a review of available research on expertise, Feldon (2007) defines an expert as one whose performance is superior to others, has status in the community, and has experience in the domain. Similarly, Geisler (1994) defines expertise as having knowledge greater than competence in a domain and explains that there are two dimensions of expertise. These include rhetorical process and domain content. That is, expertise is not only having knowledge in a particular field but also understanding how that knowledge is developed and used.

It is important to note that expertise is developed over time and is not considered a natural talent (Ericsson & Charness, 1994). In fact, expertise may take up to 10 years to develop (Ericsson & Charness, 1994; Feldon, 2007), as one becomes an expert by acquiring complex skills and must adapt physiologically in order to do so (Ericsson & Charness, 1994). An expert’s performance develops through incremental increases in knowledge and skill gained through practice and experience (Ericsson & Charness, 1994). And this practice and training alter the processes in which experts engage, which is what allows them to develop expertise. It is important to note that expertise is not developed through repetition of the same task. That is, it is through the type of experiences the experts have
that cause them to behave differently, not in simply practicing one task. In fact, “Individuals do not achieve expert performance by gradually refining and extrapolating the performance they exhibited before starting to practice but instead by restructuring the performance and acquiring the new methods and skills” (Ericsson & Charness, 1994, p. 731). Thus, not only must one have a focused effort on developing this expertise, but one must also engage in the behaviors of experts in order to begin the shift from one who is experienced in the field to one who is an expert in the field. One such shift that must occur is the shift in the literacy practices as these literacy practices shape how knowledge is produced and consumed in the various fields.

Literacy is the basis for the difference between the experts and the novices. This is because experts and novices read and write differently in the disciplines. Geisler (1994) argues that because of these differences, there is not a continuum of novice to expert and that these two groups actually participate in different tasks and thus are on different continuums. For example, experts create and transform knowledge but novices gain and display that same knowledge (Geisler, 1994). Because the task itself determines whether or not one would be able to participate as an expert in a field, it can be quite challenging to develop expertise in a school setting. This is because students are given access to content as “decontextualized facts divorced from rhetorical processes” (p. xiii). Thus, Geisler argues, in order to have expertise, one must have access to both the content and the rhetorical processes involved in adding to knowledge, which is often absent in schools.

For example, the tasks in which students engage can be considered. Teachers ask students questions for which answers can be found in the text. This encourages students to
believe that the text is autonomous and has all the answers, a sentiment with which no expert in any domain would agree (Geisler, 1994). This assertion was also found in Wineburg’s (1991) study, in which students who were asked to participate in reading tasks found the textbook to be reliable, although none of the experts in this study found the textbook to be reliable. Further, the writing that is assigned in schools is not extended and serves only to inform the teacher for an examination of learning, not to write to explore or create or add to the field of information as experts are charged to do (Geisler, 1994). Thus, what differentiates the expert from the novice are the tasks in which they engage and the knowledge necessary to complete those tasks, which usually involve the rhetorical processes valued by the discipline.

It cannot be assumed that one gains expertise through experience and knowledge alone (Bereiter & Scardamalia, 1993). In fact, Bereiter and Scardamalia introduce the construct of an experienced nonexpert. “The difference between experienced nonexperts and experts is that experts address problems whereas the experienced nonexperts carry out routines. It is only when the routines fail that the difference between experts and nonexperts becomes manifest” (p. 11). This aligns with Geisler’s (1994) assertion that one becomes an expert not because of the continuum of learning one is on but because of the tasks in which one participates. The tasks themselves allow participants to rely on the skills necessary to develop expertise. An examination of experts’ interactions with text provides insight into how one might engage in the successful study of that discipline.
**Expert-Novice Studies**

In order to determine these rhetorical processes valued by the disciplines, experts were consulted to participate in expert-novice studies. The main goal of the original expert-novice studies was to understand how experts think and problem-solve so that these characteristics could be used in programming or to train nonexperts (Alexander, 2003). Studies look at the strategies employed by experts as they are engaged in a task as compared to the strategies employed by novices as they are engaged in the same task (Peskin, 1998). Many of these expert-novice studies are the foundation for a discipline-specific approach to literacy instruction. Shanahan and Shanahan (2012) explain that the expert-novice studies use observations and think-aloud protocols to identify differences in performance between novices and experts. In each of these studies, the experts hold Ph.D.s in the field or were doctoral candidates (Bazerman, 1985; Charney, 1993; Peskin, 1998; Rouet, Favart, Britt, & Perfetti, 1997; Shanahan et al., 2011; Wineburg, 1991).

One study that highlighted the differences experienced by experts and novices involved the use of think-aloud protocols when reading scientific text. Charney (1993) conducted think-alouds with four graduate students (the novices) and three professional scientists who held Ph.D.s in biology (the experts) as they engaged in reading scientific text. The purpose of the study was to determine how each group viewed the text. Charney wondered if the readers would treat the texts as “straightforward, objective, and dispassionate” (p. 203) or as rhetorical works written by authors who have opinions and are employing rhetorical strategies to construct their arguments.
Charney (1993) notes several differences between the experts and the novices in this study. First, the experts previewed the texts prior to reading the text. The experts reported that this preview helped them to question the text and view the text as an intentional argument instead of an authoritative text; however, the novices did not preview the text. Additionally, the experts read in a nonlinear fashion. They skimmed and read sections of the text based on their interest. On the other hand, the novices read the text sequentially. The experts also read with the purpose of assessing the validity of the text while the novices read to comprehend and relate new knowledge to their prior knowledge. Clearly, the novices and experts interacted differently as they engaged in the text.

In another study of experts’ reading practices, Bazerman (1985) studied the ways in which seven research physicists interacted with text to determine their reading processes. Through data analysis of the experts’ think-alouds, Bazerman concludes that the scientists did not regard the texts as a static argument. Additionally, his findings were similar to the findings in Charney’s (1993) study, as these scientists also read in a nonlinear fashion and questioned the text as they read to meet a specific purpose.

Expert-novice studies were also conducted in the field of social studies. In Wineburg’s (1991) expert-novice study, historians and high school students were solicited to play the roles of expert and novice, respectively, as they interacted with historical documents. In this study, four of the six experts held Ph.D.s. and two were doctoral candidates. Wineburg (1991) found that one of the main differences between the experts and the novices was that, for the students, reading history was not “a process of puzzling about author’s intentions or situating texts in a social world but of gathering information.”
with texts serving as bearers of information” (p. 510). That is, the experts and the novices viewed even the role of the text differently.

The thinking of the experts and the novices differed distinctly in other ways as well. The experts spent a considerable amount of time sourcing the documents. Wineburg (1991) defines “sourcing” as giving attention to where the information comes from, who the authors were and what they represent, and what type of document it is, all of which requires prior knowledge. Wineburg also found that the experts would contextualize the documents or consider the context in which the text was written. A third substantial difference between the experts and the novices was that the experts sought to corroborate information by considering the agreements and disagreements across texts or between texts and one’s own knowledge base.

Another expert-novice study in the field of history was conducted as participants interacted with multiple texts (Rouet et al., 1997). The novices in the study were students in doctoral programs in the field of psychology, and the experts were history specialists working toward a doctoral degree in history. Rouet et al. found that when compared to the history novices, skilled historians utilized multiple historical documents and applied the sourcing heuristic and corroboration heuristics described in Wineburg’s (1991) study. The experts in this study also applied more criteria when evaluating sources. The varied approaches to reading the text resulted in the experts and novices interpreting the texts differently.

Additional expert-novice studies were conducted in the field of English/language arts. Peskin (1998) conducted an expert-novice study in which eight experts, who were
candidates for Ph.D.s in English, and eight novices, who were undergraduate or graduate students who had completed at least one poetry class, were asked to think-aloud as they read and interpreted two poems. The major differences found between the experts and the novices were the structure of the knowledge they held regarding allusions to other literary texts, contextualization (including the type of poem, time period, style, and possible author), and anticipation as the experts could more accurately predict what was going to occur in the poem. Additionally, the novices lacked the background knowledge to read the poems successfully and could not complete an analysis that was as thorough as that of the experts. For example, all the experts noticed that rhyming was a cue to meaning, but only two of the novices attempted to use rhyming as a clue for understanding. Experts scanned the poem for patterns and relied on notes and drawings to help them make sense of the poem. Essentially, Peskin concluded that prior knowledge of poetry and the process of reading poetry are both important to be able to analyze poetry successfully.

In these studies, experts and novices were compared in one field. In another expert-novice study, Shanahan et al. (2011) sought to determine the differences in literacy practices among experts in three disciplines: mathematics, history, and chemistry. The purpose was to determine the ways in which these experts interacted with texts in the discipline to help to create strategies to use with high school students. The authors wanted to focus on what was different in the approaches taken by experts from various disciplines in order to highlight the processes and strategic behaviors used by the experts.

The experts, who all held Ph.D.s and were professors in their respective disciplines, participated in think-alouds as they interacted with written texts and interviews for which
they were asked to explain the process and answer follow-up questions. This study confirmed Wineburg’s (1991) findings that historians sourced the documents, contextualized, and corroborated. Shanahan et al. (2011) also found that the participants paid attention to text structure, graphic elements, critique, rereading or close reading, and interest. All the experts engaged in the activities mentioned above but did so differently, as the disciplines required varied approaches.

The math experts did not rely on the source for consideration and did not contextualize the text for interpretation. These experts did reconcile the text with the reader’s knowledge to focus attention, interpreted graphics and text together in a unified manner, and had a strong emphasis on accuracy to ensure clear understanding. The mathematicians rigorously reread the text to consider all information (Shanahan et al., 2011).

For the chemists in the study (Shanahan et al., 2011), the use of the source was a factor when selecting text, but it was not used for interpretation. The date when the text was written was an important consideration as many changes and advances are made over time in the field of science. Additionally, text structure was used to support understanding and to locate information. Various text elements were seen as alternative forms of information that had to be compared, and the experts examined the plausibility of scientific information and how well it meshed with other scientific evidence. The chemists valued close reading of text focused on the information that was identified to be important.

Historians in the study (Shanahan et al., 2011) considered, explicitly and thoroughly, the author and his or her perspective. The historians found it important to use
contextualization as an interpretive device and relied on intertextual connections to determine the author’s argument and interpret perspective differences. The historians also used text structure to determine the relationship between narrative elements and the author’s argument, relied on critical analysis to determine the author’s credibility, and reread to critique the text. Finally, the historians utilized close reading that focused on information previously identified to be important. The strategies utilized by the experts from the three disciplines were applied uniquely for specific and varied purposes as was warranted by the task, the text, and the values of the discipline.

In sum, each of the expert-novice studies found distinctive differences between the ways in which the experts and the novices interacted with texts. For instance, the experts and novices differed in the ways they approached the text; the view of the role of the author (either as one who records and presents facts or as one who is constructing an argument), the role of the text, the text structure, application and integration of prior knowledge, and criteria applied for analysis all differed, which resulted in different interpretations of the text. These expert-novice studies lay the foundation for the work involving identification and teaching of the discipline-specific literacy practices.

**Discipline-Specific Literacies**

Building an understanding of what it means to engage with text in the disciplines is essential to understanding the discipline-specific approaches to learning. Each of the four disciplines included in this study has discipline-specific skills and processes that it values. “Disciplines have different ways of writing and speaking about the world. And because of
this, disciplinary experts approach texts with sets of expectations, reading strategies, and understandings firmly grounded in disciplinary knowledge” (Shanahan, 2012a, p. 71). The following sections focus on interactions with texts in the disciplines, including challenges that the texts in the disciplines present and the habits of thinking in which scholars in the field engage as they interact with texts.

Disciplinary literacy is a type of pedagogical content knowledge that revolves around learning how to learn from the texts in the various disciplines (Moje, 2007). Further, the uses and conceptions of text vary in each discipline as the reading and writing differs in each discipline (Wilson, 2011). It is important to consider that the definition of text moves beyond a traditional view of text. That is, text is defined as anything that conveys a message. It may be a film, a demonstration, a mineral, a map, a chemical equation, a photograph, or a performance. Each discipline values varied types of text. Thus, instruction should move beyond a sole focus on comprehension and should include an understanding of the uses and forms of texts in each discipline (Wilson, 2011). Students need to be able to develop differentiated literacy skills and strategies to enable them to interact successfully with the texts of each discipline (Fang, 2012a). The following sections provide a brief overview of the texts, the demands of the CCSS, and the habits of thinking valued in each of the four disciplines under consideration in this study.

**English/Language Arts**

Many of the functional literacies utilized by people in the field of English/language arts can be applied across disciplines. For example, comprehending and inferring an
author’s purpose is a skill that is valued in the English/language arts and can be applied across disciplines. Nevertheless, there are unique processes and practices that those who study in the field of English/language arts are aware of and utilize. The discussion in this section is limited to the discipline-specific processes valued in the Discourse community of English/language arts.

**Texts Valued in English/Language Arts**

Though nonfiction text is often included in English/language arts curriculum, the focus of instruction is primarily on literature. Furthermore, teachers in this field often value the process of reading the literature as well as the content of the literature itself (Wilson, 2011). Texts in the field of English/language arts can also include individual sentences, poetry, or drama. Interpretation of text with a focus on critical thinking about the author and the author’s message is also encouraged in the discipline of English/language arts (Wilson, 2011). Additionally, the NGA Center and CCSSO (2010) specifies the types of complex texts students should be able to read and interpret; these include a balance of literary and informational text.

**Demands of the CCSS in English/Language Arts**

The CCSS for English/language arts recognize the complexity of the discipline and include standards for language, writing, speaking and listening, and reading (NGA Center & CCSSO, 2010). The standards also recognize that students have difficulty understanding and interpreting complex texts; the aim of the CCSS in English/language arts is to engage
in the thinking required of complex texts. This includes analyzing how an author organizes a series of events or develops a character and attending to how this work contributes to the author’s message (NGA Center & CCSSO, 2010). Moreover, the CCSS require students of English/language arts to analyze how an account is told across several media.

The standards also identify skills on which students of English/language arts are to focus as they work to develop writing skills. The writing standards are focused on three types of writing: narrative, informational, and argumentative. These standards call for students to conduct research, attend to precision in the discipline, and focus on making decisions about writing that are appropriate to task, purpose, and audience. However, the standards do not explain what it means to use language that is appropriate to the “norms and conventions” of the discipline to which they are writing (NGA Center & CCSSO, 2010, p. 45). Thus, it is up to teachers to determine and explain the norms and conventions of the discipline that are valued. These values are based on the disciplinary literacies and habits of thinking in which those who study in the field of English/language arts engage.

Habits of Thinking in the Discipline of English/Language Arts

As noted in Peskin’s (1998) study, when poets read and interpret poetry, they focus on the genre, the time period, the structure of the text, and the author’s craft as points to consider as they interact with the text. Additionally, the discipline of English/language arts values collaborative work, problem-solving, and reading and writing complex texts (Peskin, 1998). This includes reading, interpreting, analyzing, and developing an interpretation that is supported with evidence from the text (Petrosky, McConachie, & Mihalakis, 2010).
Moreover, any interpretation must be supported by relevant evidence from text (NGA Center & CCSSO, 2010; Hicks & Steffel, 2012). Additionally, those who study English/language arts focus on studying the rhetorical processes in the work of others and as a means to include these rhetorical processes in their own writing so that they may create texts that attend to the audience, purpose, and type of writing they are creating (Hicks & Steffel, 2012).

Although the field of English/language arts does indeed rely on some literacies that can be applied across contexts, there are also discipline-specific processes and content that must be taught in a manner that attends to the norms and conventions of the discipline. Nevertheless, a clear definition of what the norms and conventions of the discipline are not provided by the CCSS; further it is unclear whether teachers have their own definitions of what it means to possess knowledge of the norms and conventions of the discipline of English/language arts.

**Mathematics**

In the past, many teachers of mathematics did not believe that literacy instruction was appropriate for a mathematics classroom. This may have been because much math teaching utilizes the transmission model, and in this model, there is little room for the inclusion of disciplinary-literacy practices (Draper, 2002). Currently, reform for instruction in mathematics, including the implementation of the CCSS, is moving away from transmission pedagogy and toward a constructivist view of teaching and learning in math. The goal of this math reform, much like the goal of a disciplinary-literacy approach to
instruction, is to teach students how to think in the same way as mathematicians, that is, to engage in the habits of thinking in which mathematicians engage (Draper, 2002).

**Texts Valued in Mathematics**

The common texts used in a mathematics classroom are numeric and symbolic. These include graphs, written explanations or proofs, and assertions (Wilson, 2011). Reading texts in mathematics is demanding because it is its own language (Fang, 2012b). In fact, the discipline of mathematics is highly technical and has a specific vocabulary; nevertheless, there are also common terms in mathematics, such as the term *factor*, that have a specific meaning when applied to a mathematical context. The nominalization of terms also creates a complex context when reading in mathematics. Students also need to be able to develop reading facility with reading images and displays as they work to create their mathematical knowledge (Fang, 2012b).

**Demands of the CCSS in Mathematics**

As students are interacting with texts of mathematics, they are to attend to the mathematical practices listed in the CCSS for math (NGA Center & CCSSO, 2010). These correspond to the literature on what constitutes the habits of thinking involved in a disciplinary-literacy approach to instruction in mathematics. These eight mathematical practices include (1) the ability to make sense of problems and persevere in solving them by being able to explain the meaning of the problem and determine the constraints, givens, and relationships in the problems; (2) the ability to reason abstractly and quantitatively, which
means that one is able to decontextualize the situation given to determine the symbols that are present so that one can manipulate these symbols and attend to the meaning of the quantities, not just the numbers; and (3) the ability to construct viable arguments and critique the reasoning of others, which means that one is able to understand unstated assumptions, definitions, and results that are used in arguments; make conjectures; and then describe how one will test what is done in the process of solving the problem.

The fourth mathematical practice standard is to model with math, which involves using real-world scenarios to understand and solve problems by applying the math one knows to these realistic situations. The fifth is to use appropriate tools strategically and consider what is available and make decisions about when and how to use the tools to assist in solving the problem. Also, the sixth mathematical practice involves attending to precision and using appropriate terms to be able to communicate clearly. The seventh and eighth mathematical practices involve looking for and making use of structures and being able to find and express patterns or logic in repeated reasoning. These practices outlined by the CCSS are the expectations of the type of thinking and reasoning students of mathematics employ when interacting with texts in math. These practices correspond with the habits of thinking and practices of mathematicians found in the literature.

**Habits of Thinking in the Discipline of Mathematics**

Reading in mathematics is focused on “convergence, accuracy, reason, and elegance” (Siebert & Draper, 2012; p. 184). When reading in mathematics, the focus is not on the specific formula; rather, it is on the mathematical concepts present in the text.
Additionally, attention is paid to the text structure to guide reading and understanding of the text. When reading, thinking in mathematics involves problem-solving; applying a rich, precise vocabulary; and being able to visualize, either mentally or on paper, how to solve a problem (Ediger, 2012). Also, students need to be able to recognize patterns and be willing to guess and check or tinker with the information as they are learning how to complete mathematical processes (Cuoco, Goldenberg, & Mark, 1996). Further, students of mathematics should look to the end point and work backward to solve the problem (Bill & Jamar, 2010). Also, one should be able to study math the way it was developed; this includes making conjectures, generalizations, proofs, and refutations. This also includes the ability to investigate patterns of discourse in mathematical reasoning and include individual reflection and self-monitoring, which are essential to mathematical thinking (Goos, 2004). Together, these skills allow learners to make sense of math and learn to think mathematically (Bill & Jamar, 2010).

Science

The domain of science consists of varied disciplines. That is, those who study science might be biologists, physicists, or chemists. These disciplines are varied and thus possess varied processes and values; nevertheless, this section is focused on the processes identified in the field of science in which most scientists engage, though they may study in different disciplines, as this is the focus of the current study.

Studying in the sciences can be challenging because the field not only utilizes its own methods of observing, questioning, and investigating phenomena but it also possesses
its own form of language that is used to communicate about the world (Fang, 2012b).

Scientific texts are often riddled with complex, challenging, and specialized vocabulary terms. Additionally, scientists write sentences that contain long noun phrases and rely on the nominalization of terms to develop flow as they write. A nominalized term is a term that is created from a verb that allows scientists to synthesize information. For example, adaptation (created from the term “adapt”) is a process based on the evolutionary process; an understanding of many complex terms is necessary in order to understand the scientific meaning of the term “adaptation.” Additionally, many students of science are challenged because every day experiences are often contrary to scientific reasoning. For example, many students believe that seasons are caused by a change in Earth’s distance from the sun instead of by the tilt in the Earth’s axis. This misconception is probably caused by experiences students have in their daily lives. That is, when students stand closer to a heat source (fire, radiator, air vent) they become warmer. This may be the reason that students equate distance from the sun as the cause of the Earth’s seasons. It is difficult to alter students’ misconceptions.

Texts Valued in Science

A variety of texts are utilized in the field of science, and each text has its own specific purpose. For example, procedural texts provide step-by-step directions for conducting an experiment when procedural recounts describe procedures that have already been carried out (Fang, 2012a). The most common texts high school students encounter are reports that organize information, explanatory texts that explain how something works or
describe the reason for a phenomena, and exposition or text that is used to convince a reader about a particular point of view (Fang, 2012a). Other common texts include the use of models, diagrams, videos, and demonstrations (Wilson, 2011).

As scientists interact with these texts and write these types of texts, their purposes are to explain, describe, and predict natural phenomenon and to use this knowledge both to form their own arguments and to evaluate the arguments of others (Wilson, 2011). Current educational reform is meant to encourage students to engage with these various types of texts in a similar manner.

Demands of the CCSS in Science

In addition to the CCSS standards for English/language arts, the authors of the CCSS have also written literacy standards that are specific to the fields of history, science, and technical subjects. In the field of science, the CCSS require students to cite specific textual evidence to support their analysis of scientific texts and call for them to attend to the precise details of descriptions or explanations. Also, students must be able to follow multistep process precisely, determine the meaning of symbols and key terms, and focus on the structure of the relationships presented in the text. Students must also demonstrate the ability to translate quantitative information into visual form and vice versa. Another goal of the CCSS is to encourage students to assess the reasoning and evidence used in a text to support the author’s claim, primarily to learn to view the text as an argument and not a factual statement that cannot be argued (NGA Center & CCSSO, 2010). These standards
are meant to align with the habits of thinking and the text types that are described in the 
literature as habits of thinking in the discipline of science.

Habits of Thinking in the Discipline of Science

The CCSS represent significant change in education and standards reform. These 
standards require students to develop increased language capacity as they learn content that 
increases in complexity over time. Significant literacy skills are required to think about and 
engage in science learning; nevertheless, a focus only on literacy skills would result in 
missed opportunities for science learning. Thus, teachers have to design lessons that 
include the habits of thinking and be able to incorporate disciplinary-literacy instruction 
strategically (Greenleaf et al., 2011). In the science field, the habits of thinking that go 
along with the CCSS are to develop and use models; construct explanations; engage in an 
argument that is supported with evidence; and obtain, evaluate, and communicate 
information (Hakuta, Santos, & Fang, 2013) when engaging with the texts of the discipline.

Scientists approach text based on their current interests, usually focused on what 
they are currently working on; these scientists determine a purpose for reading the text prior 
to reading it (Shanahan, 2012b). As scientists read text, they are focused on the structure of 
the text and any information that violates assumptions that they hold about the content in 
the text (Bazerman, 1985; Charney, 1993; Shanahan, 2012b). Those who work in the field 
of science also value logical explanations, model building, and argumentation (Shanahan, 
2012b). Students of science need to engage scientific inquiry and learn to be metacognitive 
about their learning (Spiegel, Bintz, Taylor, Landes, & Jordan, 2010).
Social Studies

The domain of social studies consists of several disciplines, e.g., geography, U.S. history, or political science; nevertheless, the focus in the literature and in the CCSS is the ability to think in the same ways as historians. Thus, this ability to think like an historian, regardless of the specific field of study, is also the focus of this section of text.

The field of history can be a challenging discipline because it involves the retelling, interpretation, and analysis of historical events (Fang, 2012a). Also, there are a variety of texts from which to interpret and analyze historical events. These include primary source documents, secondary source documents, and textbooks; this variety presents a challenge to readers as each are read in a specific manner as texts in history explain, record, and argue. Thus, each should be read as a separate argument (Fang, 2012a). Another challenge present in the field of social studies is the use of generic nouns (e.g., the North, settlers, patriots) to describe areas and groups of people. Furthermore, abstract language is often used to explain historians’ perspectives of events or situations, which can also be a challenge for students (Fang, 2012a).

Texts Valued in Social Studies

A variety of texts are valued in the discipline of social studies. These include primary source documents, nonprint texts, and secondary source documents, as well as multimedia (Wilson, 2011). Additionally, the types of texts that are used in history include time-specific and context-specific conception of texts. Furthermore, contextualization and consideration of a particular viewpoint are important aspects to consider when reading and
interpreting texts. As students engage with texts, they are encouraged to see the authors’ views as subjective instead of the authoritative view on the topic that is being studied (Fang, 2012a).

Demands of the CCSS in Social Studies

The CCSS (NGA Center & CCSSO, 2010) for social studies outline specific reading and writing skills. These include citing specific textual evidence to support analysis of both primary and secondary sources and using multiple sources to create an understanding of an event. There is also a focus on cause and effect as the standards require students to determine if a phenomenon is a cause or if it is something that simply preceded another event. Additionally, students are required to engage in an analysis of how a text’s structure emphasizes key points or advance an explanation or analysis of a topic. Students are also required to compare the points of view of two or more authors and determine how they treat the same or similar topics.

Habits of Thinking in the Discipline of Social Studies

The purpose for reading in history is to develop “deeper and more powerful understanding of the past” (Vansledright, 2012, p. 201). The habits of thinking involved in reading history in order to develop this understanding include emphasis on the role of text. Historians view texts as arguments (Fang, 2012a; Wineburg, 1991), yet many nonexperts who engage with historical texts do not view the text in this manner. Nevertheless, Hynd, Holschuh, and Hubbard (2004) have determined that when taught to view texts in this
manner, participants in their study learned that historians were constructivists and that history texts are arguments, not truth.

In history, to develop an understanding on a topic, one needs to read multiple texts on the topic to provide a range of thinking as the belief of historians is that no one text tells a truth of what happened in the past but that several texts play a role in creating an understanding of past events (Vansledright, 2012). Taught to be critical of historical texts, experts use organizing ideas as their criteria to guide their reading, including the significance, causation, progress, decline, and change that are based on their prior knowledge of historical events (Shanahan, 2012b; Vansledright, 2012).

Historians read texts for specific purposes for reading and interpreting the text. One such purpose that a historian might use is to determine an author’s interpretative lens by understanding the author, the time period, and the intended audience. They also consider the outside factors of what was happening at the time it was written as well (Ravi, 2010). Other thinking valued by historians involves a focus on cause and effect (Fang, 2012a) and the constructs defined in Wineburg’s (1991) work, including contextualizing, corroborating, and sourcing. Additionally, historians look at the source and the context of the text as they read and seek to corroborate the information they read with other documents (Hynd et al., 2004). Taken together, these skills allow historians to engage successfully in the varied texts valued by the discipline.

Each discipline has its distinct values regarding the texts of the discipline as well as distinct values in terms of how these texts are produced and consumed. Current educational reform, specifically the implementation of the CCSS and a discipline-specific approach to
literacy instruction, requires educators to possess knowledge of both the content and the rhetorical processes of a discipline and impart this knowledge to their students. Thus, it is important to examine experiences in which secondary preservice teachers and inservice teachers engage which may allow them to engage in the habits of thinking of the disciplines.

Preservice Teacher Preparation

Clearly, providing a disciplinary-literacy approach to instruction and meeting the demands of the CCSS are complex endeavors that require teachers to possess both domain knowledge and disciplinary-literacy knowledge. Although there is a dearth in the literature regarding teachers’ disciplinary-literacy knowledge, research does suggest that teachers who have pedagogical content knowledge make a key difference in student learning (Love, 2009). Additionally, it is also clear that teachers need to have knowledge of how language works in their disciplines because if teachers possess knowledge regarding how language is used and valued in their Discourse communities and knowledge of the “modes of reasoning and the approaches to problem-solving that are characteristic of each discipline” (Love, 2009, p. 588), they will be better able to support students’ development. Nevertheless, it is important to note that without formal training, teachers are likely to be unable to support students’ learning in this manner (O’Brien et al., 1995).

Questions concerning how best to provide training to preservice teachers exist (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009). More specific questions of how best to train preservice teachers in content area and/or discipline-specific literacies also
exist. This is problematic as current approaches of teaching preservice teachers how to incorporate literacy instruction into the content areas may not change teachers’ perceptions of literacy in the classroom (Draper, Broomhead, Jensen, & Nokes, 2012). Currently, many literacy courses in secondary teacher preparation programs are taught as separate courses and are not taught within the content areas (Conley, 2012) or as a part of collaboration between content area experts and literacy experts (Draper et al., 2012).

However, promising approaches to preservice teacher education are being explored. Bain (2012) and his colleagues at the University of Michigan call for a collaborative approach to preservice teacher education in which preservice teachers spend three semesters engaging in the habits of thinking of historians. Although this approach is currently limited to preservice history teachers, this approach is likely to expand to include other disciplines. In total, little information is available regarding whether or not preservice teachers are, in fact, learning discipline-specific literacies in their content or literacy courses (Draper et al., 2012). Examining the knowledge that current teachers have is also necessary, as there is a direct connection between teachers’ knowledge and student achievement (Love, 2012).

Professional Development for Inservice Teachers

Although it is important to consider the opportunities preservice teachers have to learn about disciplinary-literacy instruction and the literacies of their disciplines, it is equally important to consider what professional opportunities might be available for teachers currently working in schools, as professional development is key to improving classroom instruction (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007) and can be used to
help teachers enact mandated reform (Desimone, Porter, Galet, Yoon, & Birman, 2002). Continuous professional development is necessary because “effective teaching is complex and involves drawing from a deep knowledge base in the content as well as instructional strategies for teaching content” (Mundry, 2005, p. 10). Teachers need support and guidance to enact educational reform, and the focus on teacher professional development can lead to improved instructional practices (Borko, 2004). This is important because educational reform has never succeeded without well-planned and well-implemented professional development (Guskey & Yoon, 2009). High schools are being asked to bring their students to higher levels of achievement than ever before, and in order to do this, they need a more focused plan for professional development (Au, 2013). This also involves understanding what is entailed in effective practice for professional development.

In her synthesis of professional development for middle school teachers, Reed (2009) found that successful professional development is based on teachers’ needs, is relevant and job-embedded, and is focused on helping teachers build skills over time. This requires a shift from “one size fits all” programming to more specific and focused programs that occur over longer periods of time. Clary, Styslinger, and Oglan (2012) studied high school teachers’ literacy learning. In the study, seven teachers from varied disciplines collaborated in a professional learning community with a university partnership for professional development. The researchers determined that high-quality professional development with embedded support impacts student achievement positively and that teachers have to participate in professional development that allows them to consider and grow in their knowledge of literacy learning (Clary et al., 2012).
In a study on professional development in a high school setting, teachers report that professional-development activities are successful when they inform practice instead of becoming something that has to be added to their instruction (Lester, 2003). Student learning can be improved by ensuring that teachers have a “deep understanding of the fundamentals of good curriculum and instruction” as teachers have to have a solid and coherent curriculum to make these changes happen (Schmoker, 2012). Accomplishing the goal of disciplinary-literacy instruction requires that teachers are well versed in the content, discourse patterns, literature practices, and habits of mind within the specific discipline. They must also be able to transfer this knowledge to their students, as the goal of professional development is to impact student achievement.

In order to connect teachers’ professional learning to student achievement, Yoon et al. (2007) determined that three steps are required. The first is that professional development has to be designed to enhance teacher knowledge and skills. Next, those skills need to improve classroom teaching, and then this improved teaching raises student achievement. Professional development can help teachers, schools, and principals meet ever increasing standards. The standards can turn into a missed opportunity to make substantial improvements in the literacy learning of high school students, but they can help students by helping teachers to work within an effective school infrastructure that allows for systematic professional learning, literacy professional development for all teachers, and teacher ownership of the improvement effort. In fact, Monte-Santo et al. (2014) conducted a three-year study of a professional-development program in which teachers were trained to use disciplinary-literacy heuristics and a researcher-designed curriculum geared toward
training students in the habits of the thinking of historians. After extended professional development, two teachers in the study were able to instruct students in the heuristics, though they sometimes made adaptations that did not align with historians’ habits of thinking.

Conclusion

The foundation of disciplinary literacy is based on the ways in which the experts in the discipline interact with the texts, the values these experts possess, and the ways in which knowledge is constructed in the field. Although understanding how experts interact with text has proven instrumental in creating a foundation for disciplinary literacy, it is imperative that high school teachers also possess this knowledge so that they are able to teach on the diagonal (McConachie, 2010). That is, high school teachers need to have the knowledge of both the content (domain knowledge) and the disciplinary literacy (rhetorical processes) themselves in order to teach these to students. Because the development of expertise, including the knowledge of those rhetorical processes valued by the discipline, is dependent upon the tasks in which learners engage, one cannot assume that high school teachers possess this knowledge. Therefore, an investigation into the types of knowledge that teachers possess is warranted and necessary.
CHAPTER 3
METHODOLOGY

The purpose of this study is to investigate the type of knowledge domains high school teachers of English/language arts, mathematics, science, and social studies report to have and the type of knowledge domains these teachers utilize when planning units for instruction. The following research questions guide the study:

1. What type of domain knowledge do high school teachers in four Discourse communities (English/language arts, mathematics, science, and social studies) possess?

2. Which knowledge domain(s) do high school English/language arts, mathematics, science, and social studies teachers draw upon when planning for instruction, as demonstrated by a think-aloud of lesson construction?

3. How do high school English/language arts, mathematics, science, and social studies teachers use domain knowledge when planning for instruction?

Research Design

To investigate these research questions, a mixed-method design was employed. According to Creswell (2012), a mixed-method study involves using both qualitative and quantitative approaches in a single study. The quantitative data collected address the research question regarding the types of knowledge teachers possess and provide an
overview of the knowledge domains. Additionally, the qualitative data provide insight into how this knowledge is employed when teachers are designing lessons for instruction. The advantage of this mixed-method approach includes both an overview of the phenomenon as well as a specific look into teachers’ practice. Although the survey provides insight, it is limited to objective statements that may not describe how teachers’ knowledge is used in practice. Thus, the qualitative methods augment the limitations present in the survey. Further, due to the volume of data necessary to provide a rich description of a teacher’s practice, the sample size for the qualitative data is limited to four participants. Thus, the quantitative data collected augments the limited sample size by providing more robust data on teachers’ self-reported knowledge.

Utilizing both methodologies provides a more thorough understanding of the research problem and research questions than either methodology could provide alone (Creswell, 2012). Further, the purpose of a mixed-method approach is to come to an understanding of a topic from multiple perspectives and provide a comprehensive view of the research questions (Mertens, 2010) and balanced information on the topic (Onwuegbuzie & Mallete, 2011).

Because each data source serves to supplement the limitations of the other, a convergent mixed-method design was employed. In this approach, data were collected simultaneously and then merged to construct a sound understanding of the research problem (Creswell, 2012), in this case, to examine the knowledge domains high school teachers report utilizing and the knowledge domains teachers rely upon when planning for instruction.
Population and Sample

For this study, the population included high school teachers who are certified and are currently teaching Grades 9-12 English/language arts, mathematics, science, or social studies in Northern Illinois. Participants were 311 teachers, ages 21-65, who were certified in and were currently teaching one of the above-mentioned subject areas in a public high school in the northern Illinois region.

Sampling Frame

The sample of teachers was selected using criterion, random (Creswell, 2003), and snowball sampling (Mertens, 2010). Although criterion sampling was used to select both the survey and the think-aloud protocol and semistructured interview participants, random sampling was used only for the selection of the survey participants. Using a data set from the department of accountability at the Illinois State Board of Education (ISBE) (2011), the researcher determined that there were 8,627 teachers in Northern Illinois who met the criteria for participation in the study. Twenty-five percent of these teachers taught math, 27% taught English, 27% taught science, and 21% taught social studies (ISBE, 2011). Using a random number table (Rand, 2001), 60 schools were selected to participate in the survey. When the researcher had a contact at each school, she asked those contacts to send the email invitation to teachers who met the criteria in the school (54% of the surveys were completed in this way). When the researcher did not have a contact in the school, cold emails were sent to prospective participants using SurveyMonkey (46% of the surveys were completed in this way).
Because the researcher used contacts to facilitate some of the communication with some participants, it is impossible to calculate the completion rate of the surveys. This is because the researcher shared a link to the survey with contacts she had in other schools. Those contacts shared the link with the teachers in the schools in hopes they would be willing to complete the survey for someone they knew tangentially. Because of this, the researcher does not know exactly how many teachers were given the link to the survey. Thus, completion rates cannot be calculated. Although 377 teachers responded to the survey, after screening the results, only 311 of those surveys were complete enough to be used in the study.

To qualify for participation in the study, the teachers had to be high school teachers who were certified to teach and were currently teaching English/language arts, mathematics, science, or social studies. A brief letter describing the purpose of the study and the survey was delivered electronically to all participants. To ensure confidentiality, no identifying information was connected to the survey data. In order to gain consent, participants were provided with an email that explained the purpose of the survey, assured confidentiality, and reminded them that they could drop out of the study at any time (see Appendix A). The email included a note explaining that by clicking the link for the survey, participants implied consent to participate in the study. This email also included the researcher’s contact information in case a participant had questions about the study or the survey.

Through nested sampling (Mertens, 2010), four teachers were asked to participate in a think-aloud of unit development and a semistructured interview. One teacher from each
of the four content areas (English/language arts, mathematics, science, or social studies) who taught in one of the randomly selected schools comprised the sample. When the participants had been identified for the think-aloud and semistructured interview, the researcher approached each teacher, described the purpose of the study, and provided him or her with a consent form (see Appendix B). To ensure confidentiality, each participant was given a pseudonym. Because the think-aloud and semistructured interview took about two hours to complete, $50 was provided as compensation for these teachers’ time.

Institutional Review Board (IRB) approval was granted prior to implementation of the instrument pilots and data collection. These documents can be found in Appendix C.

Data Collection

A survey, a think-aloud protocol, and a semistructured interview served as the data corpus. Figure 2 clarifies how the data collection methods served to answer each research question.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Survey</th>
<th>Think-Aloud</th>
<th>Semistructured Interview</th>
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<tbody>
<tr>
<td>1. What type of domain knowledge do high-school teachers in four discourse</td>
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<td>communities (English/language arts, mathematics, science, and social studies)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>possess?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Which knowledge domain(s) do high school English/language arts, mathematics,</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>science, and social studies teachers draw upon when planning for instruction,</td>
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<td>as demonstrated by a think-aloud of lesson construction?</td>
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<tr>
<td>3. How do high school English/language arts, mathematics, science, and social</td>
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<td></td>
<td></td>
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<tr>
<td>studies teachers use domain knowledge when planning for instruction?</td>
<td></td>
<td>X</td>
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Figure 2: Alignment of research questions with data collection instruments/strategies.
Instrument Development

To investigate the type of domain knowledge high school teachers in four Discourse communities (English/language arts, mathematics, science, and social studies) possess and report utilizing, data were collected through a survey (Baumann & Bason, 2011; Mertens, 2010). The online survey was developed and piloted by the researcher prior to data collection. The items were developed after a review of the literature on the expert-novice studies that shape the disciplinary-literacy approach to instruction, discipline-specific literacies, and the demands of the CCSS. The survey also questioned teachers’ beliefs about whether or not they believed their students were prepared to participate in the type of thinking required by both the CCSS and a disciplinary-literacy approach to instruction.

The survey was organized into five sections and consists primarily of closed-ended Likert-style questions that have five options from which participants could select. For the first two sections of the survey, teachers responded that they were very likely (5), likely (4), undecided (3), unlikely (2), or very unlikely (1). In the third and fourth section of the survey, teachers reported being very confident (5), confident (4), undecided (3), unconfident (2), or very unconfident (1). The 5-point scale was selected as there are minimal gains in reliability when surveys use scales greater 5- to 7-point scales (Smith, Wakely, de Kruit, & Swartz, 2003). Additional items were included to obtain information regarding teachers’ number of years of teaching experience, their educational experience, certification, gender, and professional-development opportunities. These closed-ended scales require respondents to use the same stimuli when formatting their response and to focus on areas relevant to the research.
The first section of the survey asked teachers about their views of the roles of the text and their views of authors. The second section asked teachers about their own use of disciplinary-literacy strategies. The third section asked questions about which concepts regarding disciplinary-literacy instruction teachers were confident teaching, and the fourth section asked about teachers’ beliefs about the habits of thinking in which students engaged. The fifth section asked demographic questions. Figure 3 summarizes the constructs and provides sample survey items that address each construct. The entire survey can be found in Appendix D.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Items</th>
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| Teachers’ view of text/author                  | Directions: When you think of the term “text,” consider a broad definition. That is, text is anything that brings a message to someone. For example, text could be a movie, an illustration, an equation, a formula, a poem, a song, an article, or a lecture.  
1. When you are interacting with texts in your discipline, how likely are you to consider the time period in which the text was written?  
2. When you are interacting with texts in your discipline, how likely are you to view the text as an authority on the subject? |
| Teachers’ use of strategies to make sense of text | Directions: When you think of the term “text,” consider a broad definition. That is, text is anything that brings a message to someone. For example, text could be a movie, an illustration, an equation, a formula, a poem, a song, an article, or a lecture.  
1. When you are interacting with texts in your discipline, how likely are you to use the structure of the text to aid your comprehension of text?  
2. When you are interacting with texts in your discipline, how likely are you to create a drawing to aid comprehension? |

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<table>
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<th>Construct</th>
<th>Items</th>
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| Teachers’ considerations for planning for instruction  | 1. Rank your confidence in selecting appropriate text for your discipline.  
|                                                        | 2. Rank your confidence in teaching students how to use the structure of the text to assist comprehension. |
| Teachers’ views of students’ abilities to engage in habits of thinking | 1. Rank your confidence in your students’ ability to use appropriate terminology when discussing a topic.  
|                                                        | 2. Rank your confidence in your students’ ability to draw conclusions from text independently. |
| Demographics                                           | Which of the following subject areas are you certified to teach? (English/language arts, mathematics, social studies, science)  
|                                                        | 2. Which of the following subject areas do you currently teach? (English/language arts, mathematics, social studies, science) |

**Figure 3.** Summary of survey constructs and sample items.

The think-aloud protocol and semistructured interview questions were also created by the researcher. The format of the think-aloud was created based on the review of several studies that utilized that methodology (e.g., Geisler, 1994; Peskin, 1998). The purpose of using this methodology was that it allows insight into a teacher’s decision-making process. The teachers were able to share what they were thinking in the moment and explain why they were making the decisions. Further, the interview questions were developed after an extensive review of the literature on the expert-novice studies, discipline-specific literacies, and the demands of the CCSS. Several items from the survey were included as interview questions in an attempt to triangulate the data.
Instrument Pilot

Pilot Survey

After obtaining IRB approval for this research study, the researcher asked two colleagues who were well-versed in survey methodology to review the draft to determine if there were necessary revisions prior to piloting the survey. The researcher also asked colleagues who were familiar with the concept of disciplinary literacy to review the survey to consider whether or not they believed that the items represented disciplinary literacy constructs. After the surveys were reviewed, it was piloted at the district where the researcher was employed, as those teachers were excluded from participation in the study but represented the population in that they were high school English/language arts, mathematics, social studies, and science teachers. Ten of these teachers were asked to answer the survey and provide feedback on the clarity of the items; the goals of the pilot study were to be sure that the language was clear and appropriate, that there were no glaring omissions, that the teachers believed the items were appropriate, and that the directions were clear (Johnson & Brooks, 2009). Revisions were made to the survey based on this feedback.

Forty additional teachers were then asked to answer the revised survey to complete the pilot and test the reliability of each of the items (Johnson & Brooks, 2009). Twenty-nine teachers completed the survey pilot. Cronbach’s alpha was applied to determine whether or not the items were reliable in measuring the construct (Field, 2009). The disciplinary-literacy knowledge survey was found to be highly reliable (42 items; $\alpha = .93$).
No additional items needed to be removed from the survey. Each section of the survey was also highly reliable (Section 1, 9 items, $\alpha = .81$; Section 2, 14 items, $\alpha = .84$; Section 3, 8 items, $\alpha = .85$; and Section 4, 11 items, $\alpha = .87$).

**Think-Aloud and Semistructured Interview Pilot**

Prior to collecting data, the think-aloud protocol and the semistructured interview were piloted with one teacher for the purpose of validating the protocol and interview questions; this teacher was also excluded from participation in the study. To pilot the think-aloud protocol, one English/language arts teacher with seven years of experience who was the researcher’s colleague was asked to think-aloud when planning an upcoming unit of instruction and then participate in the semistructured interview with the goal of providing feedback on the process and the questions. The teacher in the pilot offered ideas involving providing clarified and printed instructions and offered suggestion about the order of some of the questions presented in the interview. The researcher clarified the directions and also created a bulleted list of instructions to serve as a guide for research participants. Revisions also included the restructuring of some interview questions. Also, some questions were revised, omitted, or rewritten to ensure a more conversational flow as the pilot participant believed that the order of the questions as presented prohibited natural conversation about the topics. These suggestions were used to revise the protocol and interview questions before using them with the teachers in the study.
Survey

After the pilot was completed and the instruments were revised, the researcher identified the sample and found the teachers’ email addresses on each school’s website. If the researcher determined that she had a contact at one of the schools, she contacted that person and asked him or her to send the link to the survey to teachers in the school. If the researcher did not have a contact at the school, she sent an email invitation with the link to the teachers, using email addresses that were available on the districts’ websites. If there were no email addresses on the website, the researcher contacted the department chairpersons of each of the four core departments and asked them to send the link to their teachers. Three reminders, sent one week apart, were sent over three weeks to participants who had been contacted via email but had not yet completed the survey. If the researcher’s contacts facilitated sending surveys to their colleagues, no reminders were sent. At the end of the third reminder, the collector was closed for all surveys. Data were then downloaded into SPSS to ready them for analysis.

Think-Aloud Protocol and Semistructured Interviews

A think-aloud protocol (see Appendix E) was used to facilitate teachers’ thinking during lesson construction, in particular, the type of knowledge they rely upon when planning for instruction. The protocol offers insight into how individuals complete a task, which, in this case, includes planning a unit for instruction (Charters, 2003; Ericsson & Simon, 1980). In this method, participants complete a cognitive task and verbalize their process during the act. The protocol created for this study was designed to ask teachers to
participate in a think-aloud as he or she planned a unit for instruction. During the think-aloud, the researcher’s role was to place a card that stated, “Share your thinking” next to the participants’ work station to remind them to share their thoughts. If the participant did not speak for two minutes, the researcher asked the participant to share his or her thinking out loud.

The think-alouds took place in each teacher’s classroom or work station so that he or she had access to planning materials. In one case, the think-aloud took place in the teacher’s home. The semistructured interviews took place immediately following the think-aloud and took between 15 and 20 minutes to complete (see Appendix F). The purpose of the semistructured interview was to attempt to discover teachers’ beliefs about necessary information to utilize when planning for instruction. Each teacher completed both the think-aloud protocol and the semistructured interview.

Each think-aloud and interview was audio- and video-recorded. Additionally, teachers shared artifacts such as tests, activities, and other documents with the researcher. Each teacher was told that he/she had up to two hours to participate and that the researcher would alert him/her 15 minutes prior to the time limit but otherwise would remain silent unless the researcher believed the teacher needed to be reminded to share his or her thinking. Three teachers completed the think-aloud in less than two hours; however, the math teacher, who indicated that she would like to continue past the two-hour mark, completed her think-aloud in two hours and 20 minutes. Together, the think-aloud protocol and the semistructured interview provide a more detailed description of how teachers use their knowledge to construct units for instruction.
The digital audio was sent to a transcriptionist, and transcripts were reviewed for accuracy by the researcher. When the researcher was sure the transcripts were accurate, they were sent to the participants for review. Each participant was asked to review the transcript to ensure that the transcripts represented the manner in which the teacher planned for instruction. When the participants had been able to review the documents for two weeks, the researcher sent a follow-up email asking for any feedback, clarifications, changes, or omissions. Only the English/language arts teacher emailed to clarify one answer he provided regarding his knowledge of disciplinary literacy and his professional development. He wanted to clarify that he did indeed understand disciplinary literacy. During his interview, he stated he did not have any professional development in the area; he had, in fact, read an article about disciplinary literacy and shared this with his colleagues. None of the teachers provided any revisions to their process or the thinking they had shared. After this change was made to the transcript, the transcripts were ready for data analysis.

Data Analysis

Data analysis procedures are described in detail in this section. This includes the analysis of the survey, the think-aloud protocol, and the interview questions.

Survey

The responses from the survey were downloaded to an SPSS file for analysis. Descriptive statistics were explored, including the means, standard deviations skewness, and kurtosis of survey items, as well as frequency counts of the teachers’ number of years
of experience, disciplines, and education (Mertens, 2010). This allowed the researcher to review the data. She determined that there were 66 surveys (of 377) that were less than 85% complete. These were removed from the sample. Thirty-two of the excluded surveys were only 18% complete; participants had completed only Section 1 of the survey, which contained nine items. Twenty-seven of the excluded surveys were 46% completed as participants completed only Sections 1 and 2 of the survey, for a total of 23 items. Finally, seven of the excluded surveys were 62% completed or less. None of the excluded surveys contained demographic information; therefore, it was impossible to tell if these surveys were missing at random as no identifying information was collected.

In the second stage of data analysis, a principal component analysis (PCA) factor analysis was conducted to determine which factors would be used for subsequent analysis. This factor analysis was conducted to simplify the data to ready it for use in predictive models. A one-way MANOVA was then conducted with these factors to explore what, if any, differences existed among the teachers of the four disciplines. The independent variable in this model was the teachers’ discipline (English/language arts, math, science, or social studies), and the dependent variables were the five factors retained after factor analysis. These factors included teachers’ views of students’ abilities to engage in the habits of thinking, teachers’ views of authors and texts, teachers’ confidence in teaching the habits of thinking, teachers’ use of general strategies, and teachers’ views of the role of text. This statistical model was employed to answer Research Question 1 to determine what type of knowledge teachers in the four disciplines reported possessing. The following hypotheses were tested:
$H_0$: There were no statistically significant differences in the ways in which English/language arts, math, science, and social studies teachers answered survey items that loaded into the factors.

$H_1$: There was a statistically significant difference in at least one group of teachers, English/language arts, math, science, or social studies, in the ways in which they answered survey items that loaded into the factors.

This approach provides more specific information about the types of knowledge utilized, and the ways in which this knowledge varies depending upon the Discourse community to which a teacher belongs. Post-hoc testing was also conducted.

**Think-Aloud and Semistructured Interview**

The think-aloud and interview data was transcribed verbatim with the exception of taking measures to protect the confidentiality of the participant by using pseudonyms. This resulted in 176 pages of typed transcripts in the data set. To ensure accuracy of the account, member-checking was employed (Creswell, 2012). Each participant was provided with the transcript of his or her think-aloud and semistructured interview to review. Participants were allowed to clarify any statements or make general comments on what was present in the transcript. Revisions were considered before analysis began.

The qualitative data were analyzed in three stages. During each of the three stages, analytic memos were recorded to capture the researcher’s thoughts and reflections.
Stage 1: Descriptive Coding

Saldana (2009) suggests that the first stage of coding lays the foundation for the rest of the data analysis. Descriptive coding was used during this first stage in the process. Descriptive coding (Wolcott, 1994) involves the researcher reviewing the data and using a noun to summarize the basic topic of the passage. Saldana (2009) reminds researchers to ensure that the noun describes the topic present in the selection of text, not the main idea of the passage. This method was selected for the initial stage of coding because it is an effective practice for researchers who are beginning to explore data. It also provides an organizational structure that can be particularly helpful in the second stage of coding (Saldana, 2009). After organizing the descriptive codes for analysis, two additional coding techniques were utilized to make sense of the data.

Stage 2: Axial Coding and Frequency Counts

The second stage of coding allowed for more advanced ways to reorganize and reanalyze the data (Saldana, 2009). Thus, the descriptive codes were first organized into categories (Charmaz, 2006) of the types of knowledge that teachers utilize. These include codes that were created during the first stage of analysis.

After this more advanced look at the data, frequency counts were taken (LeCompte & Schensul, 1993) to consider what type of thinking the teachers engaged in when they were planning a unit for instruction. Frequency counts allowed a look into the specific types of activities in which the teachers participated and how often they engaged in each activity. After the researcher created axial codes for the types of knowledge on which the
teachers relied, she recoded the data to determine what the teachers were doing as they considered the information. Axial codes were then created for each of these codes and were then divided into an idea unit. An idea unit was defined as one complete thought, ranging from one to two sentences in nature. An example of an idea unit is “And because we just came out of graphing, they’re used to everything being ‘Y equals.’ And they can’t get that out of their heads that either variable is okay.”

None of the answers to the interview questions were considered for this part of the analysis as the focus is on the thinking that the teachers were engaged in, not the content of the thinking. Also, anything that was a direct explanation to the researcher was omitted. For example, when the math teacher explained, “Sometimes it’s easier because they have it in the graphing calculator, so they put in two columns and call it Y1 and then Y2 for the second equation,” this information was not included in the frequency counts. Although this is certainly important to what she was doing, the way she explained it to the researcher was not part of her regular thinking process.

Stage 3: Assertion Development

In the third stage of data analysis, the data were mined for themes: the researcher reviewed the coded data and the analytic memos to construct credible and trustworthy statements based on the evidence presented in the surveys, the think-aloud transcriptions, and the semistructured interview transcripts (Saldana, 2009). These initial assertions were supported with data from the survey and the transcripts. These assertions were written as arguments that utilized evidence from the data corpus.
Once the data were analyzed, the themes underwent peer review. A colleague and fellow doctoral candidate reviewed the codes and themes and offered feedback as to whether or not she agreed with the assertions and the supporting information. This colleague also reviewed drafts of analysis to ensure that assertions were well-supported.

Conclusion

In this chapter, the research methodology was reviewed. Furthermore, population and sampling techniques, data collection methods, and data analysis methods were described. Chapter 4 contains the results of the data analysis, which include an exploration of descriptive statistics, a one-way MANOVA, and post-hoc testing.
CHAPTER 4

RESULTS

The purpose of this study was to investigate the domain knowledge high school English/language arts, mathematics, science, and social studies teachers possess, as well as the knowledge they utilize when planning for instruction. Three hundred and eleven high school English/language arts, mathematics, science, and social studies teachers from the northern region of Illinois participated in a survey, the purpose of which was to uncover high school teachers’ knowledge of disciplinary literacy and disciplinary-literacy instruction. Items on the survey were designed to elicit insight into teachers’ views of texts, their habits of mind, and their beliefs about their students’ abilities to engage in disciplinary-literacy practices. Four of these teachers, one from each of the focal disciplines, also participated in a think-aloud of unit planning and a semistructured interview in an attempt to learn which knowledge domains teachers utilized and the behaviors they exhibited when planning units for instruction.

This chapter provides information on the results of data analysis. Because this was a convergent study (Creswell, 2012), data were collected and then analyzed simultaneously in an attempt to offer insight by answering the three research questions. Although the data analysis of the survey is reported first and is followed by the qualitative data analysis from the think-aloud protocol and semistructured interviews, all data were considered to examine
teachers’ knowledge and use of knowledge when planning for instruction. Together, the data corpus attempts to investigate the following research questions:

1. What type of domain knowledge do high school teachers in four Discourse communities (English/language arts, mathematics, science, and social studies) possess?

2. Which knowledge domain(s) do high school English/language arts, mathematics, science, and social studies teachers draw upon when planning for instruction as demonstrated by a think-aloud of unit construction?

3. How do high school English/language arts, mathematics, science, and social studies teachers use domain knowledge when planning for instruction?

Data Analysis

After preliminary data screening was completed, descriptive statistics, factor analysis, MANOVA, and post hoc tests were utilized to analyze survey data to address the first research question regarding the type of knowledge teachers report to possess.

Descriptive Statistics

After screening the data, descriptive statistics were reviewed to determine how respondents answered items on the survey. The survey contained 42 items that were organized into four sections; demographic information was collected in the fifth section of the survey and is reported later in this chapter. The descriptive statistics for the responses to the survey items are organized into four sections and are reported in Tables 1 through 4.
Table 1

Descriptive Statistics of Survey Items: Section 1: Teachers’ Views of Text and Author

<table>
<thead>
<tr>
<th>Abbreviated Stem</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness Statistic</th>
<th>Skewness Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider the author to determine text’s credibility</td>
<td>4.07</td>
<td>1.14</td>
<td>-1.23</td>
<td>.13</td>
<td>.54</td>
<td>.26</td>
</tr>
<tr>
<td>Consider context surrounding text</td>
<td>3.83</td>
<td>1.24</td>
<td>-.85</td>
<td>.13</td>
<td>-.44</td>
<td>.25</td>
</tr>
<tr>
<td>Read more than one text when studying a topic</td>
<td>4.33</td>
<td>.85</td>
<td>-1.75</td>
<td>.13</td>
<td>3.57</td>
<td>.26</td>
</tr>
<tr>
<td>Read more than one type of text</td>
<td>4.42</td>
<td>.72</td>
<td>-1.52</td>
<td>.13</td>
<td>3.04</td>
<td>.26</td>
</tr>
<tr>
<td>View text as source of factual information</td>
<td>4.17</td>
<td>.74</td>
<td>-.78</td>
<td>.13</td>
<td>.90</td>
<td>.26</td>
</tr>
<tr>
<td>View text as an authority on the topic</td>
<td>3.78</td>
<td>.78</td>
<td>-.66</td>
<td>.13</td>
<td>.66</td>
<td>.26</td>
</tr>
<tr>
<td>View text as argument</td>
<td>3.50</td>
<td>1.20</td>
<td>-.45</td>
<td>.13</td>
<td>-.83</td>
<td>.26</td>
</tr>
<tr>
<td>Consider author’s point-of-view</td>
<td>3.79</td>
<td>1.26</td>
<td>-.83</td>
<td>.13</td>
<td>-.48</td>
<td>.26</td>
</tr>
<tr>
<td>Consider author’s purpose for writing</td>
<td>3.87</td>
<td>1.19</td>
<td>-.93</td>
<td>.13</td>
<td>-.15</td>
<td>.26</td>
</tr>
</tbody>
</table>
Table 2
Descriptive Statistics of Survey Items: Section 2: Teachers’
Use of Strategies to Make Sense of Texts

<table>
<thead>
<tr>
<th>Abbreviated Stem</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness Statistic</th>
<th>Skewness Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilize prior knowledge to make meaning</td>
<td>4.75</td>
<td>.44</td>
<td>-1.43</td>
<td>.13</td>
<td>.65</td>
<td>.26</td>
</tr>
<tr>
<td>Set a purpose to read</td>
<td>4.34</td>
<td>.78</td>
<td>-1.44</td>
<td>.13</td>
<td>2.58</td>
<td>.26</td>
</tr>
<tr>
<td>Preview the text</td>
<td>4.07</td>
<td>1.03</td>
<td>-1.17</td>
<td>.13</td>
<td>.72</td>
<td>.26</td>
</tr>
<tr>
<td>Use text structure</td>
<td>4.08</td>
<td>.92</td>
<td>-.99</td>
<td>.13</td>
<td>.60</td>
<td>.27</td>
</tr>
<tr>
<td>Interpret graphics and images</td>
<td>4.58</td>
<td>.65</td>
<td>-1.81</td>
<td>.13</td>
<td>3.95</td>
<td>.26</td>
</tr>
<tr>
<td>Investigate patterns</td>
<td>4.12</td>
<td>.94</td>
<td>-.92</td>
<td>.13</td>
<td>.03</td>
<td>.26</td>
</tr>
<tr>
<td>Make generalizations</td>
<td>4.24</td>
<td>.75</td>
<td>-1.13</td>
<td>.13</td>
<td>1.90</td>
<td>.26</td>
</tr>
<tr>
<td>Read texts in order from start to finish</td>
<td>3.42</td>
<td>1.22</td>
<td>-.38</td>
<td>.13</td>
<td>-1.08</td>
<td>.26</td>
</tr>
<tr>
<td>Focus on accuracy of information</td>
<td>4.26</td>
<td>.82</td>
<td>-1.56</td>
<td>.13</td>
<td>3.39</td>
<td>.27</td>
</tr>
<tr>
<td>Focus on precise terminology</td>
<td>4.07</td>
<td>.91</td>
<td>-1.05</td>
<td>.13</td>
<td>.62</td>
<td>.26</td>
</tr>
<tr>
<td>Focus on how precisely information is presented</td>
<td>3.97</td>
<td>.86</td>
<td>-.77</td>
<td>.13</td>
<td>.16</td>
<td>.27</td>
</tr>
<tr>
<td>Create a drawing to aid comprehension</td>
<td>3.40</td>
<td>1.25</td>
<td>-.41</td>
<td>.13</td>
<td>-1.01</td>
<td>.27</td>
</tr>
<tr>
<td>Write as you read to aid comprehension</td>
<td>4.03</td>
<td>.99</td>
<td>-1.02</td>
<td>.13</td>
<td>.39</td>
<td>.26</td>
</tr>
<tr>
<td>Make predictions as you are reading</td>
<td>3.77</td>
<td>1.11</td>
<td>-.83</td>
<td>.13</td>
<td>-.15</td>
<td>.26</td>
</tr>
</tbody>
</table>
Table 3
Descriptive Statistics of Survey Items: Section 3: Teachers’ Consideration When Planning for Instruction

<table>
<thead>
<tr>
<th>Abbreviated Stem</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness Statistic</th>
<th>Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching students to use text structure</td>
<td>3.90</td>
<td>.93</td>
<td>-1.06</td>
<td>.13</td>
<td>.92</td>
<td>.27</td>
</tr>
<tr>
<td>Teaching students to construct arguments</td>
<td>3.98</td>
<td>.88</td>
<td>-.91</td>
<td>.13</td>
<td>.83</td>
<td>.27</td>
</tr>
<tr>
<td>Teaching students to critique arguments</td>
<td>3.75</td>
<td>.95</td>
<td>-.59</td>
<td>.13</td>
<td>-.25</td>
<td>.27</td>
</tr>
<tr>
<td>Teaching students to solve real-world problems</td>
<td>4.24</td>
<td>.71</td>
<td>-.96</td>
<td>.13</td>
<td>1.36</td>
<td>.27</td>
</tr>
<tr>
<td>Use more than one text to verify an idea</td>
<td>4.05</td>
<td>.87</td>
<td>-.88</td>
<td>.13</td>
<td>.68</td>
<td>.27</td>
</tr>
<tr>
<td>Use more than one type of text</td>
<td>4.15</td>
<td>.75</td>
<td>-.84</td>
<td>.13</td>
<td>1.10</td>
<td>.27</td>
</tr>
</tbody>
</table>
Table 4

Descriptive Statistics of Survey Items: Section 4: Teachers’ Confidence in Students’ Ability to Engage in Habits of Thinking

<table>
<thead>
<tr>
<th>Abbreviated Stem</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness Statistic</th>
<th>Skewness Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select texts with diverse formats</td>
<td>4.14</td>
<td>.84</td>
<td>-1.04</td>
<td>.13</td>
<td>1.15</td>
<td>.27</td>
</tr>
<tr>
<td>Provide students with text sets</td>
<td>3.91</td>
<td>.89</td>
<td>-.89</td>
<td>.13</td>
<td>.72</td>
<td>.27</td>
</tr>
<tr>
<td>Identify a pattern</td>
<td>3.50</td>
<td>.94</td>
<td>-.45</td>
<td>.13</td>
<td>-.70</td>
<td>.27</td>
</tr>
<tr>
<td>Use terms with precision</td>
<td>3.57</td>
<td>.94</td>
<td>-.64</td>
<td>.13</td>
<td>-.41</td>
<td>.27</td>
</tr>
<tr>
<td>Use appropriate terminology</td>
<td>3.52</td>
<td>.93</td>
<td>-.61</td>
<td>.13</td>
<td>-.59</td>
<td>.27</td>
</tr>
<tr>
<td>Draw conclusions from text independently</td>
<td>3.27</td>
<td>1.04</td>
<td>-.28</td>
<td>.13</td>
<td>-.87</td>
<td>.27</td>
</tr>
<tr>
<td>Cite evidence to support an idea</td>
<td>3.57</td>
<td>1.01</td>
<td>-.57</td>
<td>.14</td>
<td>-.41</td>
<td>.27</td>
</tr>
<tr>
<td>Use evidence drawn from text</td>
<td>3.60</td>
<td>.97</td>
<td>-.67</td>
<td>.13</td>
<td>-.26</td>
<td>.27</td>
</tr>
<tr>
<td>Analyze the development of an event or character over time</td>
<td>3.43</td>
<td>.89</td>
<td>-.32</td>
<td>.14</td>
<td>.05</td>
<td>.27</td>
</tr>
<tr>
<td>Compare approaches taken by two or more authors</td>
<td>3.26</td>
<td>.91</td>
<td>-.27</td>
<td>.13</td>
<td>-.41</td>
<td>.27</td>
</tr>
<tr>
<td>Analyze how point-of-view shapes a text</td>
<td>3.38</td>
<td>.95</td>
<td>-.26</td>
<td>.14</td>
<td>-.50</td>
<td>.27</td>
</tr>
<tr>
<td>Analyze how reading for a specific purpose shapes text</td>
<td>3.41</td>
<td>.94</td>
<td>-.40</td>
<td>.13</td>
<td>-.47</td>
<td>.27</td>
</tr>
<tr>
<td>Follow a multi-step procedure</td>
<td>3.65</td>
<td>.96</td>
<td>-.79</td>
<td>.13</td>
<td>.03</td>
<td>.27</td>
</tr>
</tbody>
</table>

The first section of the survey included items designed to measure teachers’ own views of texts and authors. In this section, teachers were asked to report their likeliness to engage in the behavior indicated in the stem. Teachers could indicate that they were very likely (5), likely (4), undecided (3), unlikely (2), or very unlikely (1) to engage in the task described. The mean scores indicate that most teachers considered the author and type of text when interacting with the texts of their disciplines; further, the items were negatively
skewed which indicates that more responses were clustered around the higher end of the scale. Four of the items in this section were leptokurtic, and the remaining items were platykurtic. Two items are highly kurtotic (having values greater than 3). These items indicate teachers’ likeliness of using more than one text when studying a topic and teachers’ likeliness of using more than one type of text when studying a topic. When items are highly kurtotic, it is likely that more of the variance in items is the result of extreme deviations from the mean. The survey uses only a 5-point scale, which indicates that teachers in various disciplines think in various ways about these items, which is consistent with the findings in the literature. Descriptive statistics, including the mean, standard deviation, skewness, and kurtosis, for all items in this section are shown in Table 1.

The second section of the survey included items designed to determine teachers’ own use of strategies when interacting with text. In this section, teachers were also asked to report their likeliness to engage in the behavior indicated in the stem and could respond that they were very likely (5), likely (4), undecided (3), unlikely (2), or very unlikely (1) to use the strategy described in the stem. The mean scores indicated that teachers were likely to engage in the strategies listed in the stem. The items were negatively skewed, which indicated that the scores for those items were clustered in the higher end of the tail. All but three items were leptokurtic, indicating that there were many scores in the tails of the distribution. Descriptive statistics for all items in the second section are shown in Table 2.

The third section of the survey included items designed to uncover teachers’ confidence in including constructs of disciplinary literacy when planning for instruction. Teachers could respond that they were very confident (5), confident (4), undecided (3),
unconfident (2), or very unconfident (1). The mean scores indicated that teachers were mostly confident in providing students with opportunities to engage in disciplinary-literacy instructional activities. The responses to the items were negatively skewed, which indicated that the scores for those items were clustered in the higher end of the tail. All but one item were platykurtic, indicating that there were not as many scores in the tails of the distribution. Table 3 includes the descriptive statistics for all items in Section 3 of the survey.

The fourth section of the survey included items regarding teachers’ confidence in their students’ abilities to engage in the habits of thinking necessary for discipline-specific literacy instruction. Teachers could respond that they were very confident (5), confident (4), undecided (3), unconfident (2), or very unconfident (1). The mean scores fell into the middle of the scale range for these items. The responses to the items were negatively skewed, which indicated that the scores for those items were clustered in the higher end of the tail. All but four items were leptokurtic, indicating a range of responses in the distribution. Table 4 includes the descriptive statistics for all items in Section 4 of the survey.

The descriptive statistics presented in Tables 1 through 4 provide an overview of how all teachers responded to all items on the survey. Although this provides an overview of the responses, further statistical modeling, including factor analysis, MANOVA, and Scheffé post-hoc testing, provide more information regarding teachers’ knowledge of disciplinary literacy and disciplinary-literacy instruction.
Factor Analysis

In order to simplify the data and identify factors that would later be used in predictive models, a factor analysis was conducted. A Principal Component Analysis (PCA) was conducted on the 42 items from the survey with orthogonal rotation (varimax) (see Table 5). Although some factors are undoubtedly correlated, the literature suggests that some of the items disciplines and was not separated into separate surveys by discipline.

Table 5

Table/Structure for Coefficients: Varimax Rotation of Six-Factor Solution for High School Teachers’ Disciplinary-Literacy Knowledge

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
<th>Question</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Component 5</th>
<th>Component 6</th>
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The Kaiser-Meyer-Olkin measure (KMO) and the Bartlett’s test of sphericity were used to verify sampling adequacy. KMO values were > .85, which is above the acceptable limit of .6 (Pallant, 2006). Bartlett’s test of sphericity \( X^2 \ (861) = 5573.62, p < .001 \), indicated that the data were suitable for PCA. When the data had been found suitable for PCA, an initial analysis was run to obtain eigenvalues for each component of the data. Eleven components had eigenvalues over Kaiser’s criterion of 1 and in combination explained 65.3% of the variance. The scree plot (see Figure 4) suggested retaining six factors. Parallel analysis confirmed that six factors should be retained (see Table 6). The six factors retained include (1) teachers’ views of students’ abilities to engage in habits of mind, (2) teachers’ views of authors and texts, (3) teachers’ confidence in teaching habits of thinking, (4) teachers’ use of general strategies, (5) teachers’ interactions with texts, and (6) teachers’ views of the role of text. Because there were only two items in the sixth factor, the researcher decided to remove this factor from subsequent analysis. The five remaining factors accounted for 60.5% of the variance.
Figure 4. Scree plot.

Table 6
Parallel Analysis

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<th>Actual Eigenvalue from PCA</th>
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<td>2.138</td>
<td>Accept</td>
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<td>1.565</td>
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<td>1.2351</td>
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<td>Reject</td>
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Descriptive Statistics by Factor and by Discipline

Because individual survey questions are imperfect measures of the population traits, there is a need to distill survey data down to the most relevant information. Factor analysis can be used when the phenomenon of interest is complex and not directly measurable via a single question (Fricker, Kulzy, & Appleget, 2012). In this case, the construct of disciplinary literacy and teachers’ beliefs about their own teaching ability and their students’ ability are complex, warranting the use of factor analysis.

Factor loadings, means, and standard deviations are reported for the entire sample for the five remaining factors and means and standard deviations are also provided for each of the factors by discipline. The theory of disciplinary literacy suggests that members of various Discourse communities would have different views of texts and different values (e.g., Moje, 2008; Shanahan & Shanahan, 2008). Therefore, although it is important to examine how the items loaded for each factor, it is also important to determine how the groups of English/language arts, mathematics, science, or social studies teachers, responded. Loadings, means, and standard deviations are reported by factor. First, this information from the whole group is reported. Next, the means and standard deviations of teachers’ responses are reported by discipline.

Factor 1: Teachers’ Beliefs Regarding Students’ Abilities to Engage in the Habits of Mind

Items that loaded into this factor were designed to investigate whether or not teachers believed their students were able to engage in the habits of thinking required by the CCSS (NGA Center & CCSSO, 2010). These items include some of the concepts in the
CCSS. For example, argumentation, in a manner that attends to the norms and conventions of arguments in the discipline, is an anchor standard in English/language arts and literacy for history, science, and technical subjects. The ability to construct an argument and critique the reasoning of others is also a requirement of the mathematical practice standards (NGA Center & CCSSO, 2010). Thus, argumentation and other constructs central to the CCSS that align with the habits of thinking incorporated into a disciplinary-literacy approach to instruction were included in the survey.

The factor loadings, means, and standard deviations are reported overall for each item that loaded onto Factor 1 in Table 7. Factor loadings greater than .40 are desirable and indicate a robust structure. Reviewing the teachers’ responses to the factors provides insight into the ways in which these teachers reported interacting with the texts in their disciplines and their belief in their students and in their own ability to teach their students the habits of thinking in the disciplines.

Reviewing teachers’ responses to the factors by discipline is more informative as each discipline is unique in its approach to and beliefs about text (Moje, 2008). Although some of the items on the survey apply more directly to one group of teachers than to others, all teachers were asked the same questions, in part to determine whether or not there were differences in the ways in which teachers from various disciplines answered. For example, math teachers may not spend time teaching students how to analyze how an author develops a character or event over time but would spend more time teaching students to follow multistep procedures. Therefore, one would expect the math teachers to have less
confidence in their students’ ability to analyze the development of a character or event over time but more confidence in student’s ability to following multistep procedures.

The survey and subsequent analysis attempt to measure teachers’ knowledge regarding the constructs of disciplinary literacy as mentioned in the literature. Given the close connection between these constructs and the CCSS, items were also included in an

<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in students’ ability to use evidence drawn from the text</td>
<td>.788</td>
<td>3.60</td>
<td>.97</td>
</tr>
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<td>Confidence in students’ ability to draw conclusions for the text independently</td>
<td>.762</td>
<td>3.27</td>
<td>1.04</td>
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<td>Confidence in students’ ability to cite evidence to support an idea.</td>
<td>.760</td>
<td>3.57</td>
<td>1.01</td>
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<td>Confidence in students’ ability to use terms in your discipline with precision</td>
<td>.664</td>
<td>3.57</td>
<td>.94</td>
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<td>Confidence in students’ ability to analyze how reading for a specific purpose shapes text</td>
<td>.661</td>
<td>3.41</td>
<td>.94</td>
</tr>
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<td>Confidence in students’ ability to compare approaches taken by two or more authors</td>
<td>.651</td>
<td>3.26</td>
<td>.91</td>
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<tr>
<td>Confidence in students’ ability to follow a multistep procedure</td>
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<td>3.65</td>
<td>.96</td>
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<td>Confidence in students’ ability to analyze how point-of-view or purpose shapes a text</td>
<td>.634</td>
<td>3.38</td>
<td>.95</td>
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<td>Confidence in students’ ability to use appropriate, discipline-specific terminology when discussing a topic</td>
<td>.634</td>
<td>3.52</td>
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<tr>
<td>Confidence in students’ ability to analyze the development of an event or character over time</td>
<td>.628</td>
<td>3.43</td>
<td>.89</td>
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</table>
attempt to measure teachers’ knowledge of and confidence in their students’ ability to engage in the behaviors embedded into the CCSS.

Teachers who implement the CCSS ask students to cite evidence from text when answering questions. English/language arts teachers were the most confident ($M = 4.0$, $SD = .93$) (see Table 8) (the maximum score on scale is 5) in their students’ ability to cite evidence from the text, followed, respectively, by social studies, science, and math teachers. Also, teachers of English/language arts ($M = 3.6$, $SD = .93$) and social studies ($M = 3.3$, $SD = .94$) had more confidence that their students would draw conclusions from text independently, but the math teachers ($M = 3.2$, $SD = .94$) and science teachers ($M = 3.4$, $SD = .89$) were slightly less confident. English/language arts teachers ($M = 23.9$, $SD = 1.00$) and social studies teachers ($M = 3.8$, $SD = .94$) reported being slightly more confident in their students’ ability to cite evidence to support an idea than the math teachers ($M = 3.1$, $SD = .91$) and science teachers ($M = 3.3$, $SD = .95$).

Table 8

Means by Discipline for Factor 1: Teachers’ Views of Students’ Abilities to Engage in Habits of Mind

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<th>Factor</th>
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<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
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<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
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<tr>
<td>Confidence in students’ ability to use evidence drawn from the text</td>
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<td>.93</td>
<td>3.2</td>
<td>.94</td>
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<tr>
<td>Confidence in students’ ability to draw conclusions from the text independently</td>
<td>3.6</td>
<td>.93</td>
<td>2.9</td>
<td>1.00</td>
</tr>
</tbody>
</table>

(continued on following page)
Science ($M = 3.4, SD = 1.00$) and social studies teachers ($M = 3.4, SD = 1.10$) reported being equally confident in their students’ abilities to use terms in the discipline with precision; the English/language arts ($M = 3.6, SD = .87$) and math teachers ($M = 3.6, SD = .81$) also responded similarly. The math teachers ($M = 3.0, SD = .79$) reported being the least confident in students’ abilities to read for a specific purpose to shape text, and the English/language arts teachers ($M = 3.7, SD = .94$), social studies teachers ($M = 3.4, SD = 1.00$), and science teachers ($M = 3.3, SD = .92$) were less confident.
Another item that loaded into the factor was teachers’ confidence in students’ ability to compare approaches taken by two or more authors in a text. In this case, the math teachers again reported being less confident, likely because this is not a common practice in most math curricula ($M = 3.0, SD = .75$). English/language arts teachers ($M = 3.4, SD = .98$), science teachers ($M = 3.3, SD = .86$), and social studies teachers ($M = 3.4, SD = .98$) were only slightly more confident.

The math teachers were the most confident ($M = 3.8, SD = .81$) in their students’ abilities to follow a multistep procedure, and the science teachers were slightly less confident ($M = 3.5, SD = 1.00$). Social studies teachers ($M = 3.8, SD = .89$) were the most confident that their students could analyze how point of view or purpose shapes a text, and math teachers were the least confident ($M = 3.0, SD = .81$). The English/language arts teachers ($M = 3.7, SD = .88$) were the most confident that their students were able to use appropriate, discipline-specific terminology when discussing a topic and were also the most confident ($M = 3.9, SD = .80$) when considering their students’ ability to analyze the development of a character over time.

The means of teachers’ responses do not indicate that any one group of teachers had a great deal of confidence in the items that loaded into the factor. Although it is helpful to examine the means and standard deviations of these items, further statistical modeling is necessary to truly consider whether or not these differences are significant among the groups of teachers.

**Factor 2: Teachers’ Views of Authors and Texts**
Teachers in a Discourse community share specific views of authors and texts as compared to those in other Discourse communities (Moje, 2007). Therefore, one might expect that as teachers of four distinct Discourse communities, teachers would approach differently the items that loaded into this factor: Teachers’ views of authors and texts (see Table 9). For example, in the literature Wineburg (1991) determined that expert historians considered the author’s point of view when reading the text and would not view the text as a source of factual information and would instead see a text as an argument being constructed by the author.

Table 9
Factor 2: Teachers’ Views of Authors and Texts

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<th>SD</th>
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<tr>
<td>View the text as an argument the author is creating</td>
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<td>3.50</td>
<td>1.20</td>
</tr>
<tr>
<td>View texts as a source of factual information</td>
<td>.741</td>
<td>3.87</td>
<td>1.19</td>
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<tr>
<td>Consider the events taking place around the time the text was written</td>
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<td>3.83</td>
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<tr>
<td>Consider the author to determine whether or not the source is credible</td>
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<td>4.07</td>
<td>1.14</td>
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</tbody>
</table>

As expected, social studies teachers were more likely \( (M = 4.5, SD = .67) \) to consider the author’s point-of-view than were math teachers \( (M = 2.6, SD = .22) \) or science teachers \( (M = 3.2, SD = 1.2) \) (see Table 10). English/language arts teachers also reported focusing on an author’s point-of-view \( (M = 4.5, SD = .54) \) as they interacted with texts. The English/language arts \( (M = 4.3, SD = .74) \) and social studies teachers \( (M = 4.1, SD = .89) \) also reported being more likely to view the text as an argument the author was making
than were the math teachers \((M = 2.3, SD = 1.1)\) and science teachers \((M = 3.0, SD = 1.1)\).

All teachers reported being likely to view the text as a source of factual information \((M = 3.9, SD = 1.2)\). The social studies teachers \((M = 4.6, SD = 0.60)\) and English/language arts teachers \((M = 4.5, SD = 0.65)\) reported being likely to consider the events taking place around the time the text was written and were also likely to consider the author to determine whether or not the source was credible. The factor loadings in Factor 2 were greater than .40, which indicates a robust structure.

### Table 10

Means by Discipline for Factor 2: Teachers’ Views of Authors and Texts

<table>
<thead>
<tr>
<th>Factor</th>
<th>English</th>
<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider author’s point of view when reading text</td>
<td>4.5 .54</td>
<td>2.6 .22</td>
<td>3.2 1.20</td>
<td>4.5 .67</td>
</tr>
<tr>
<td>View the text as an argument the author is creating</td>
<td>4.3 .74</td>
<td>2.3 1.10</td>
<td>3.0 1.00</td>
<td>4.1 .89</td>
</tr>
<tr>
<td>View texts as a source of factual information</td>
<td>4.1 .88</td>
<td>4.1 .85</td>
<td>4.3 .49</td>
<td>4.2 .66</td>
</tr>
<tr>
<td>Consider the events taking place around the time the text was written</td>
<td>4.5 .65</td>
<td>2.7 1.20</td>
<td>3.5 1.20</td>
<td>4.6 .60</td>
</tr>
<tr>
<td>Consider the author to determine whether or not the source is credible</td>
<td>4.5 .74</td>
<td>3.2 1.30</td>
<td>3.9 1.00</td>
<td>4.5 .86</td>
</tr>
</tbody>
</table>

**Factor 3: Teachers’ Confidence in Teaching the Habits of Thinking**

Items that loaded Factor 3 were created to determine whether or not teachers were confident in teaching the habits of thinking that were identified in the expert-novice studies and were also required by the CCSS. In this case, the items that loaded for this factor all
considered teachers’ confidence in creating experiences that would foster students’ success in the habits of thinking of the disciplines as they interacted with texts (see Table 11). English/language arts teachers were the most confident \( (M = 4.4, \ SD = .69) \) that they could teach their students to use more than one text to verify an idea presented in the text, and math teachers were the least confident \( (M = 3.3, \ SD = .85) \) (see Table 12). The English/language arts teachers also reported being the most confident in teaching students to use more than one type of text when building an understanding of the topic \( (M = 4.4, \ SD = .62) \), and the math teachers again were the least confident \( (M = 3.6, \ SD = .73) \). Science teachers reported being the most confident in selecting texts with diverse formats \( (M = 4.3, \ SD = .85) \), but math teachers were the least confident \( (M = 3.9, \ SD = .80) \). Also, the English/language arts teachers were the most confident in being able to provide students with sets of texts that they could use to answer a question independently \( (M = 4.2, \ SD = .70) \), and the math teachers were least confident \( (M = 3.5, \ SD = .79) \). Further statistical modeling explains whether or not these differences are significant.

<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in teaching students to use more than one text to verify an idea presented in the text</td>
<td>.735</td>
<td>4.05</td>
<td>.87</td>
</tr>
<tr>
<td>Confidence in teaching students to use more than one type of text when building an understanding of the topic</td>
<td>.726</td>
<td>4.15</td>
<td>.75</td>
</tr>
<tr>
<td>Confidence in selecting texts with diverse formats</td>
<td>.677</td>
<td>4.14</td>
<td>.84</td>
</tr>
<tr>
<td>Confidence in being able to provide students with sets of texts they can use to independently answer a question</td>
<td>.650</td>
<td>3.91</td>
<td>.89</td>
</tr>
</tbody>
</table>
### Table 12

Means by Discipline for Factor 3: Teachers’ Confidence in Teaching Habits of Thinking

<table>
<thead>
<tr>
<th>Factor</th>
<th>English</th>
<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in teaching students to use more than one text to verify an idea presented in the text</td>
<td>4.4</td>
<td>.69</td>
<td>3.3</td>
<td>.85</td>
</tr>
<tr>
<td>Confidence in teaching students to use more than one type of text when building an understanding of the topic</td>
<td>4.4</td>
<td>.62</td>
<td>3.6</td>
<td>.73</td>
</tr>
<tr>
<td>Confidence in selecting texts with diverse formats</td>
<td>4.0</td>
<td>.84</td>
<td>3.9</td>
<td>.80</td>
</tr>
<tr>
<td>Confidence in being able to provide students with sets of texts they can use to independently answer a question</td>
<td>4.2</td>
<td>.70</td>
<td>3.5</td>
<td>.79</td>
</tr>
</tbody>
</table>

**Factor 4: Teachers’ Use of General Strategies**

The items that loaded into the fourth factor regard teachers’ own use of general strategies when engaging with text (see Table 13). English/language arts teachers reported that they were likely to preview the text prior to reading ($M = 4.4$, $SD = .79$) (see Table 14), and teachers in other disciplines reported similar means regarding their likeliness of previewing the text prior to reading. The English/language arts teachers were most likely to set a purpose for reading the text ($M = 4.6$, $SD = .64$) and to use the structure to aid comprehension of the text ($M = 4.4$, $SD = .70$).
Table 13
Factor 4: Teachers’ Use of General Strategies

<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preview the text prior to reading</td>
<td>.698</td>
<td>4.07</td>
<td>1.03</td>
</tr>
<tr>
<td>Set a purpose to read the text</td>
<td>.659</td>
<td>4.34</td>
<td>.78</td>
</tr>
<tr>
<td>Use the structure of the text to aid comprehension</td>
<td>.603</td>
<td>4.08</td>
<td>.92</td>
</tr>
</tbody>
</table>

Table 14
Means by Discipline for Factor 4: Teachers’ Use of General Strategies

<table>
<thead>
<tr>
<th>Factor</th>
<th>English</th>
<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Preview the text prior to reading</td>
<td>4.4</td>
<td>.79</td>
<td>3.9</td>
<td>.96</td>
</tr>
<tr>
<td>Set a purpose to read the text</td>
<td>4.6</td>
<td>.64</td>
<td>4.0</td>
<td>.91</td>
</tr>
<tr>
<td>Use the structure of the text to aid comprehension</td>
<td>4.4</td>
<td>.70</td>
<td>3.7</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Factor 5: Teachers’ Interactions with Texts

The items that loaded into Factor 5 involve teachers’ interactions with text in their discipline (see Table 15). These items focus on teachers’ disciplinary-literacy thinking as the teachers’ views of texts are a major component of their discipline-specific thinking (Fang, 2012b; Moje, 2008). Items that loaded into this section were designed to investigate the thinking teachers engaged in while interacting with the texts in their disciplines.
Table 15
Factor 5: Teachers’ Interactions with Texts

<table>
<thead>
<tr>
<th>Item</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on how precisely the information is presented</td>
<td>.747</td>
<td>3.97</td>
<td>.86</td>
</tr>
<tr>
<td>Investigate patterns present in the material</td>
<td>.637</td>
<td>4.12</td>
<td>.94</td>
</tr>
<tr>
<td>Focus on the precise terminology present in the text</td>
<td>.633</td>
<td>4.07</td>
<td>.91</td>
</tr>
<tr>
<td>Focus on the accuracy of the information present in the text</td>
<td>.601</td>
<td>4.26</td>
<td>.82</td>
</tr>
</tbody>
</table>

For example, the social studies teachers reported being most likely to focus on how precisely information is presented in the text ($M = 4.5, SD = .66$) (see Table 16). Science teachers also reported that they focused on how precisely information is presented in the text ($M = 4.3, SD = .76$). Math teachers reported being the most likely to investigate patterns present in material ($M = 4.4, SD = .77$), but social studies teachers reported being the least likely to focus on the precise terminology present in the text ($M = 3.8, SD = .98$). Finally, all teachers were similarly likely to focus on the accuracy of information present in the text.

Table 16
Means by Discipline for Factor 5: Teachers’ Interactions with Texts

<table>
<thead>
<tr>
<th>Factor</th>
<th>English</th>
<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Focus on how precisely the information is presented</td>
<td>4.2</td>
<td>.71</td>
<td>4.0</td>
<td>1.00</td>
</tr>
<tr>
<td>Investigate patterns present in the material</td>
<td>4.1</td>
<td>.90</td>
<td>4.4</td>
<td>.77</td>
</tr>
<tr>
<td>Focus on the precise terminology present in the text</td>
<td>4.0</td>
<td>.80</td>
<td>4.4</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Creating Variables for Further Testing

In order to investigate whether or not the means by discipline were statistically significant, further statistical modeling was necessary. To prepare to use these factors in predictive measures, nonrefined factors were used. One way to combine these factors is to use the averages of the factors to combine the factors into new variables (DiStefano, Zhu, & Mindrila, 2009). Averages for the factors were used to create new variables. These new variables, which were the means of items that loaded into the factors, were used in subsequent statistical models including a MANOVA and Scheffe post-hoc testing.

Results of MANOVA

As mentioned in the review of the literature, members of Discourse communities have shared values and beliefs. These beliefs extend to their views of authors and texts as well as to the ways in which they interact with the texts that are valued by the Discourse community. In part, this study sought to determine whether or not high school teachers engaged in similar thinking as the experts in the field who served as the subjects of the expert-novice studies. It is important to determine if, in fact, high school English/language arts teachers have differing views of text than do math teachers and if high school science teachers hold differing views than social studies teachers, as is reflected in the literature. A MANOVA can indicate whether or not the disciplinary-literacy knowledge these teachers
reported to possess differs among the four disciplines. A MANOVA was conducted to compare factors across disciplines.

Do Teachers’ Self-Reported Knowledge Domains Vary by Discipline?

Demographic data of the participants in each discipline are identified in Table 17. In order to investigate the type of knowledge teachers reportedly possessed, it was important to consider whether or not the teachers’ knowledge differed in regard to the discipline in which each teacher taught.

Table 17
Demographic Data by Discipline

<table>
<thead>
<tr>
<th>Demographic</th>
<th>English</th>
<th>Mathematics</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>95</td>
<td>66</td>
<td>94</td>
<td>56</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74</td>
<td>43</td>
<td>56</td>
<td>25</td>
</tr>
<tr>
<td>Male</td>
<td>24</td>
<td>23</td>
<td>38</td>
<td>31</td>
</tr>
<tr>
<td>Number of years of experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 8</td>
<td>29</td>
<td>12</td>
<td>31</td>
<td>16</td>
</tr>
<tr>
<td>9-12</td>
<td>19</td>
<td>15</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>13-18</td>
<td>21</td>
<td>21</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>19+</td>
<td>26</td>
<td>18</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>17</td>
<td>8</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Master’s</td>
<td>53</td>
<td>36</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>Second master’s</td>
<td>19</td>
<td>19</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Certificate of Advanced Study</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Doctorate</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
The MANOVA was selected because it compares two or more groups in terms of their means on a group of dependent variables (Pallant, 2009). Further, Field (2009) explains that a MANOVA is more powerful than a series of ANOVAs when looking to see if there are differences among groups, as it reduces the Type I error rate, which would indicate that there was a difference when there was not. Therefore, a MANOVA was selected to compare teachers from each discipline across the five retained factors. Although more robust against Type I error rate than an ANOVA, a MANOVA is a more complex procedure that requires several assumptions to be met. The assumptions that were tested and the results are described in detail as follows.

**Assumptions**

The first assumption of a MANOVA is that the sample size must have more cases in each cell than dependent variables, and this assumption is met, as there are six dependent variables and a sample size over 20 in each group (see Table 17 for sample sizes).

The second assumption is that there should be a normal distribution. This assumption is violated in this data set, but Tabachnik and Fidell (2000) explain that a sample size of at least 20 ensures robustness; therefore, the decision was made to continue on with this MANOVA instead of a series of ANOVAs because the sample size was large enough.

A third assumption is that there are no significant outliers. After comparing the mahalanobis distances (24.02) to the critical values present in Pallant’s (2009) book, two outliers were identified. These two cases (case 234: 24.07 and case 261: 22.94) were
outliers. Because there were only two cases and these cases did not have extreme values, the decision was made to leave the two cases in.

There was no evidence of nonlinearity, so the assumption of linearity was met. The assumption of homogeneity of regression did not apply because there was no need for the tests to be run in any particular order.

Large sample sizes are prone to violations of equality of variances. Talbachnik and Fidell (2001) suggest that in order to reduce the possibility of type 1 error, a more robust alpha of .01 should be used. Also, using Pillai’s criteria instead of Wilks test will ensure robust data analysis if any violations have been made (Talbachnik & Fidell, 2001), so alpha was set at .01, and Pillai’s criteria were used.

After reviewing the assumptions, a MANOVA was performed to investigate any differences in the ways teachers’ responded across the five factors. The independent variables were the disciplines. The results of the MANOVA are described as follows.

Differences Among the Four Disciplines Across Five Factors

There was a statistically significant difference among the teachers in the four disciplines using Pillai’s trace value (.64), $F = (15, 909) = 16.52, p < .001$. Partial eta squared was .214, indicating a small effect size (Cohen, 1992). An effect size is a quantitative measure of the degree to which variability in the observations can be attributed to the conditions—in this case, the degree to which the differences in teachers’ responses can be attributed to their various disciplines. Partial eta squared was used to calculate effect size, and Cohen’s (1992) guidelines were used to interpret effect size. Using these
guidelines, a small effect is .02, a medium effect is .13, and a large effect is .26. When an effect size is small, it would be difficult to determine the difference among scores by simply looking at the scores. A medium effect would be noticeable to the naked eye, and a large effect would be quite obvious.

When the results for the dependent variables were considered separately, the mean of Factor 5 was not shown to be significant, \( F = (3, .800) = 1.969, \ p = 119 \). However the four other factors are significant (see Table 18).

**Table 18**

Results of MANOVA by Factor

<table>
<thead>
<tr>
<th>Factor</th>
<th>Result</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>( F = (3, 3.9) = 8.59, p &lt; .001 )</td>
<td>( \eta_p^2 = .078 ) (small effect)</td>
</tr>
<tr>
<td>Factor 2</td>
<td>( F = (3, 52) = 110.9, p &lt; .001 )</td>
<td>( \eta_p^2 = .522 ) (large effect)</td>
</tr>
<tr>
<td>Factor 3</td>
<td>( F = (3, 7.33) = 19.8, p &lt; .001 )</td>
<td>( \eta_p^2 = .156 ) (medium effect)</td>
</tr>
<tr>
<td>Factor 4</td>
<td>( F (3, 5.27) = 10.665, p &lt; .001 )</td>
<td>( \eta_p^2 = .095 ) (small effect)</td>
</tr>
<tr>
<td>Factor 5</td>
<td>Results not statistically significant</td>
<td></td>
</tr>
</tbody>
</table>

The results of the MANOVA indicate that there was a statistically significant difference in the ways in which the teachers in the four disciplines responded to the items that loaded into Factor 1, teachers’ confidence in students’ ability to engage in the habits of thinking. For Factor 2, teachers’ views of authors and texts, there was a statistically significant difference in the ways in which the teachers from the four disciplines responded to the items; there was a large effect size for these differences. There was a statistically significant difference regarding the teachers’ responses for the third factor, teachers’
confidence in teaching the habits of thinking, with a medium effect. Finally, there was a small effect in the statistically significant differences in teachers’ responses to items that loaded into the fourth factor, teachers’ use of general strategies. To determine which group of teachers differed from one another, post-hoc testing was necessary. In order to control against Type II error, power needs to be greater than or equal to .80. Using a GPower calculator, based on a medium effect and an alpha level of .01, to have power greater than or equal to .80, the total sample size needs to be 144 or above. Because there were 311 teachers who participated in the study, the sample has power and, thus, controls against Type II error.

Post-Hoc Tests

In order to determine where differences lie in the factors, post-hoc tests were conducted, as the F ratio in the omnibus test was not sufficient to answer the research question regarding the knowledge teachers reported to possess by discipline (Tabachnick & Fidell, 2001). Field (2009) suggests that when selecting post-hoc tests, tests should be chosen that control for Type I error but that are also powerful enough to maintain statistical power. Further, Tabachnick and Fidell suggest that when using post-hoc testing, the Scheffe procedure should protects against inflated Type I error and, although conservative, allow for an unlimited number of comparisons. The results of the Scheffe post hoc test follow.

Analysis using the Scheffe’ post hoc criterion for significance indicated that English/language arts teachers differed from math teachers ($p < .001$) and science teachers
(p < .001), but not from social studies teachers for the items that loaded Factor 1 (teachers’ views of students’ abilities to engage in habits of mind). The math, science, and social studies teachers differed only from English/language arts teachers and did not differ from one another. For Factor 2 (teachers’ views of authors and texts), results indicated that English/language arts teachers differed from math teachers (p < .001) and science teachers (p < .001) but did not differ from social studies teachers. Math teachers differed from English/language arts teachers (p < .001), science teachers (p < .001), and social studies teachers (p < .001). Science teachers also differed from social studies teachers (p < .001), English/language arts teachers (p < .001), and math teachers (p < .001). For Factor 3 (teachers’ confidence in teaching habits of thinking), results indicated that English/language arts teachers differed from math teachers (p < .001) but not from science teachers or social studies teachers. Math teachers also differed from science teachers (p < .001) and social studies teachers (p < .001). Finally, in Factor 4 (teachers’ use of general strategies), English/language arts teachers differed from math teachers (p < .001) and science teachers (p < .001) but not from social studies teachers. No other groups of teachers had statistically significant differences in Factor 4. Teachers in the four focal disciplines did vary in their responses to the factors.

Although reviewing the results of the survey data provides a larger view of the knowledge that teachers reported to have, taking a closer look at the qualitative data also provides insight into the knowledge that teachers rely on when they are planning lessons for instruction and the skills they utilize when planning for instruction. The qualitative data analysis is reviewed in the following section.
Qualitative Data Analysis

The quantitative data analysis considered the knowledge that teachers reported to possess. This information offers insight into the processes teachers use in each of the disciplines as they consider text, their students’ abilities to engage with text and use information from text, and their own confidence in teaching students how to engage with and use text. The analysis of the think-aloud protocol and the semistructured interview responses serve to explore the remaining research questions. In addition, the entire data corpus is considered in order to investigate the knowledge that high school teachers have and use when planning lessons for instruction.

Qualitative data analysis was completed in three phases. Phase 1 involved descriptive coding (Wolcott, 1994), which allowed the researcher to understand and identify what was happening when teachers were planning lessons for instruction. Next, these descriptive codes were grouped, reviewed, revised, and used to form axial codes (Charmaz, 2006) that allowed the researcher to form a clearer picture of the data and begin to interpret the information. Frequency counts (LeCompte & Schensul, 1993) focused on only the data from the think-aloud process and did not include data from the interviews or from breaks in the think-aloud process. Assertions were then developed (Saldana, 2009) that provided insight into these four teachers’ practices when planning lessons for instruction.

Although the sample size for the think-aloud and semistructured interview was small, the goal was to uncover what knowledge these teachers relied on and the type of thinking in which they engaged when planning lessons for instruction and then to determine
whether or not there were connections between these behaviors and the knowledge the
survey respondents reported to possess. Combining information from all sources of data
provides a more robust picture of teachers’ knowledge and planning processes than any of
the three could provide alone.

Ideally, the goal of qualitative research is to observe something in its natural
environment and then describe it (Golafshani, 2005). Although this context created for the
think-aloud was contrived, the teachers were participating in an activity in which they
naturally participate on a regular basis. These teachers were not told how to plan or what to
plan. Instead, the researcher met the teachers in an environment in which they were
comfortable planning and observed what was usually a solitary practice. The teachers were
asked to review transcripts to ensure that the transcripts reflected their planning process and
their thoughts that were shared during the interviews.

After the transcripts were reviewed by the participants, they were printed for ease of
analysis and organized by participant into folders, along with any other artifacts that were
collected during the think-aloud protocol. Each section of text (which was approximately
four to six sentences) was labeled with a one- to three-word phrase to describe what was
happening during that section of the transcript. This was done so that the researcher could
gain a sense of what was happening in each section (Saldana, 2009). These codes were
general and did not attempt to interpret the data in any way. For example, some codes
during this phase of analysis were “text selection,” “collaboration”, and “instruction.”
Next, in order to be able to read these codes across cases, new documents were created by
code, and information from the original transcripts was copied and pasted into the new
document and organized by code. Each code was organized into a table and labeled by participant. Then the researcher reviewed these new documents to determine the themes that emerged across cases.

Next, in Phase 2 of the analysis, axial codes were created both across themes and across cases. In order to do this, the researcher reviewed the tables of information across all cases and read and reread the information present in each code. Axial codes were then created to consolidate the data. For example, the axial code “Teachers’ Use of General Literacy Strategies for General Literacy Instruction” was created from these descriptive codes: vocabulary instruction, comprehension, writing to learn, and strategies/strategy.

When these axial codes had been created, the information on the tables was reorganized so that the researcher could review the data and begin to create assertions. Assertions such as “Teachers’ planning is impacted by their knowledge of and access to curricular guidelines” included axial codes such as: “use of curriculum materials,” “use of standards,” “collaborations with colleagues produce instructional goals,” “objectives,” and “understandings.” Assertions were then developed from these axial codes. The quantitative data were reviewed to determine whether those data supported these assertions as well.

In order to create the frequency counts regarding which skills the teachers were relying on when planning lessons for instruction, the researcher returned to the original transcripts and identified sections of text in which the teacher was thinking through his or her planning process. At times, teachers would break from their planning to explain something to the researcher. These comments and any information gathered from the
interviews were not included in the frequency counts as they did not reflect the teacher’s thinking process. The researcher reviewed the descriptive codes on these sections of texts and added notes regarding the behaviors in which the teachers were engaging. The number of idea units was then calculated. An idea unit is defined as one complete thought, which may be comprised by several sentences, regarding an action being taken by the teacher.

The descriptive codes of idea units were used to create axial codes regarding the behaviors in which a teacher engaged when planning for instruction. For example, the descriptive codes “noting misunderstanding, thinking about students’ prior knowledge, and noting student mistakes” were combined to create the axial code “Considering students’ knowledge or misconceptions.” When these had been labeled and reviewed for content accuracy, the researcher reviewed the data that was coded in this way to ensure that the data represented a thought process and not an explanation from the teacher. Then, the researcher counted the number of times each occurred to obtain the frequency counts across all four disciplines (see Figure 5 for a description of the codes and an example of data from the think-aloud that was coded in this way). After all phases of data analysis were completed, the assertions were then drafted and supported with the evidence from the survey, the semistructured interviews, and the think-aloud protocols.
<table>
<thead>
<tr>
<th>Code</th>
<th>Example</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Considering students’ knowledge and/or misconceptions</td>
<td>“And because we just came out of graphing, they’re used to everything being ‘Y equals.’ And they can’t get that out of their heads that either variable is okay.” (Math: Christina)</td>
<td></td>
</tr>
<tr>
<td>Referencing materials/texts/sources of curriculum</td>
<td>“I don’t like the supplemental book with the worksheets. But the [problem] generator I like because I can pick if I do need to do more drill and practice with them; I could pick a problem and generate it over and over again.” (Math: Christina)</td>
<td></td>
</tr>
<tr>
<td>Reflecting, leading to affirming, or rejecting an idea</td>
<td>“Hmmm. Vector preparation quiz or what I want to know about vectors. I’m gonna have to look in my journal and see what I did there. So I don’t think I’ve used this in a while.” (Science: Max)</td>
<td></td>
</tr>
<tr>
<td>Considering content from a previous lesson or unit</td>
<td>“And then remembering last year, what did kids notice about these that I had never noticed? Or which pictures didn’t elicit any reactions? Do I wanna throw some of these out?” (Social Studies: Claire)</td>
<td></td>
</tr>
<tr>
<td>Selecting instructional and/or literacy strategies</td>
<td>“I can ask students to make a connection to the text. And because we want students to exceed standards, make an option available where students would also include an outside source.” (English: Adam)</td>
<td></td>
</tr>
<tr>
<td>Addressing a habit of thinking (overtly stated or implied)</td>
<td>“So [after watching the demonstration on inertia], I want you to write observations. . . . What’s your explanation? Why did what happened happen?” (Science: Max)</td>
<td></td>
</tr>
<tr>
<td>Considering sequence of instruction</td>
<td>“So if I start with Blink and weave in the writing pieces at the same time, students will be better equipped to put together their panel presentation at the end.” (English: Adam)</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5.** Codes and examples of idea units.

**Trustworthiness**

In qualitative research, the researcher can attempt to assure validity through triangulation of sources to support assertions (Golafshani, 2003). In this study, data from the interviews, survey, and think-alouds were considered when creating assertions. This allowed for multiple sources of evidence to support assertions made in this study, which are presented in the following sections.
Participant Overview

Four teachers were identified for participation in the study through nested sampling (Mertens, 2010). That is, these teachers taught at schools that were selected randomly to participate in the survey. Through contacts the researcher had at these schools, four teachers, one from each of the core disciplines of English/language arts, mathematics, science, and social studies, were asked to participate in the study. These teachers and their school contexts are described in detail. All names are pseudonyms.

Christina Meyers

Christina Meyers had been teaching math in a large suburban Chicago school district for 12 years. Prior to teaching at her current school, she worked for a textbook company. Christina taught at one of the schools in a three-high-school district. Thirty-one percent of the 2,398 students in this high school were classified as low income and 59% of students in the school met or exceeded state standards on standardized testing (Northern Illinois University [NIU], 2014).

Christina taught two levels of algebra--algebra honors to freshmen and a bridge program of algebra to juniors who struggled with mathematics. She explained that these two courses were actually quite similar in content and pacing, even though the students were in different grade levels. She was certified to teach Grades 6-12 mathematics and also held a master’s degree in guidance counseling, even though she had not worked as a counselor.
Christina was the only teacher who preferred to work from home than to work in her classroom or office space. Upon arrival at her home, the researcher found Christina’s dining room table covered with planning materials, including her computer, textbooks, resource books, and scratch paper. Christina explained that she usually began by planning for honors algebra and then modified her plans to use in the junior-level curriculum.

She began planning by reviewing the goals of her unit, which involved solving systems of equations. She then consulted her resources, including her textbook and the supplemented materials she brought in, and considered the vocabulary terms her students might not know. She was also concerned with drawing a connection between this unit and the unit before to help her students create connections between the units. After considering how her freshman would react to the instruction, she then considered how her juniors would react to the material. She repeated this process throughout her planning. That is, she would consider her goal, consider what her freshman students would need to reach this goal, and then consider how her junior-level students would handle the same lesson. At various points during planning, Christina would also stop to consider how she would deliver the content and determine which strategies she would use.

Max Anderson

Max Anderson was a science teacher who had 12 years of teaching experience. Prior to teaching honors, core, and Advanced Placement [AP]-level physics, Max had held a position as an equipment manufacturer for 17 years. He was certified to teach physics and chemistry, had currently passed his comprehensive exams, and was currently working
on his dissertation for a doctoral degree in science, social studies, and environmental education integration. Max taught in a unit district comprised of 15 schools. Fifty-six percent of the 3,693 students in his high school were classified as low income, and 44% of the students met or exceeded standards on state standardized testing (NIU, 2014).

To begin planning, Max relied on a planning guide that was created by his curricular team. The guide was designed to support both students and teachers, as it provided clear goals for the unit. For this unit, the objectives included three content-focused goals and two skill-based goals. For example, the conceptual goals include explaining and applying the phenomenon of inertia. The skill-based goal for this particular unit involved solving problems using force-body diagrams. Max’s planning guide also listed the concepts for each assessment measure and included space for students to record their progress toward mastering that skill as Max shared his unit planning guide with his students. Included on the guide was information on how students could demonstrate accelerated learning beyond mastery on any of the concepts, if they chose to do so.

Using this guide, Max planned for instruction. He reviewed his notes, reviewed materials, and made decisions based on the notes he took during the teaching of the unit regarding how things went when he had taught the unit previously. Much of his focus during the planning session was on how he would assess his instructional goals and how he could vary his instructional techniques to engage students.

Claire Nelson
Claire Nelson had been teaching social studies for seven years in a small, one-high-school district serving 1,520 students. Fifty-six percent of these students met or exceeded standards, and 48% were classified as low income (NIU, 2014). Claire was certified to teach social studies and held a master’s degree in curriculum and instruction. She currently taught AP U.S. history, U.S. history, and criminal justice courses, mostly to juniors and seniors in high school.

Claire began by explaining that she deferred to her collaborative or professional learning community for the unit she was planning during the think-aloud but stated that she tried to share her own voice more in other units. She explained that she was unable to voice her opinion as much in this particular unit as it was a favorite unit of many people on her curricular team, and so the unit did not change much from year to year.

Claire began her planning process by reviewing the chapter with which she was working. She used the information presented in the text to break the unit into sections. Each section of the text corresponded to the topics she wanted to teach. Then she reviewed what she had previously taught on those topics and found information to help her students learn that content. She reviewed what she had done in the past and discarded lessons and activities she did not like or that she believed had not gone well. Claire also considered including supplemental texts from the time period the unit was focused on (which was the Civil War). She also considered the textbook and whether or not her students would be able to comprehend sections of it. After reviewing the content for the unit, she then considered assessments and projects to facilitate student learning.
Adam Wilkinson

Adam Wilkinson had been teaching English for 19 years. He taught in a unit district where 82% of the 2,937 students in his high school met or exceeded state standards. Nine percent of these students were classified as low income (NIU, 2014). Adam served his department as a resource and was afforded one period of release time to provide resources to support teachers. Adam also served as the team leader of the ninth-grade English team. He had team-taught English with a special education teacher for the past 11 years and held master’s degrees in both English and theology.

Adam began planning by referring to his planning guide, which had been created via collaboration among team members at the district level. This planning guide listed the four standards students were expected to master by the end of the unit. The guide also listed essential questions to guide student learning and a list of content he should consider, including writing instruction, vocabulary, and specific texts that must be taught, as well as options for supplemental texts including video, poetry, and art. Once Adam considered the standards and content he was to assess, he considered how he would organize instruction and also considered which specific tasks and texts would facilitate student learning. Figure 6 provides a summary of the basic description of participants.

Assertions

The think-alouds and semistructured interviews in which these teachers engaged provided information regarding teachers’ planning practices, including the knowledge they utilized when planning lessons for instruction as well as the behaviors in which they
engaged during the planning process. After careful analysis of the data, assertions were created in an attempt to understand how teachers engage in the complex task of planning units for instruction. The assertions are presented in the remainder of this chapter.

<table>
<thead>
<tr>
<th>Qualitative Teacher Participants</th>
<th>Subject</th>
<th>Number of Years of Experience</th>
<th>Grades/Subjects Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christina Meyers</td>
<td>Math</td>
<td>12</td>
<td>Freshmen, juniors; honors algebra, bridge algebra</td>
</tr>
<tr>
<td>Max Anderson</td>
<td>Science</td>
<td>12</td>
<td>Physics, honors physics, AP physics</td>
</tr>
<tr>
<td>Claire Nelson</td>
<td>Social studies</td>
<td>7</td>
<td>Juniors; U.S. History</td>
</tr>
<tr>
<td>Adam Wilkinson</td>
<td>English</td>
<td>19</td>
<td>Freshmen; English</td>
</tr>
</tbody>
</table>

Figure 6. Summary of participants.

Assertion 1: Teachers’ Planning Is Impacted by Their Knowledge of and Access to Curricular Guidelines

One theme present in the data was that each teacher’s planning of a unit for instruction depended upon his or her understanding of the standards and/or content of the course as this was where each teacher began his or her planning process. For example, the social studies teacher, Claire, relied on her textbook, and Max (science) and Adam (English) relied on team-created planning guides. Christina (math) focused on using the topics that she knew the students needed to master. This was an important consideration, as teachers’ knowledge of the content and curriculum can lead to greater outcomes in student
learning (Schmoker, 2012) and what teachers know and present to students may or may not create opportunities that allow the students to serve as apprentices in the discipline.

Each teacher began his or her planning process with a source of content. For Christina, the math teacher, and Claire, the social studies teacher, it was the textbook, specifically a particular chapter that covered the concepts to be taught and was selected by and agreed upon by the team. Max, the science teacher, relied on goals, which were written from the most current draft of the Next Generation Science Standards (NGSS) standards at the time, to guide his instructional planning. Adam, the English teacher, relied on the power standards selected by a district-level team of teachers to frame his unit. It was these sources--either the textbook or the goals--that teachers referred to when planning for instruction. Each teacher commented on the fact that they worked in teams at each of the schools and that no teacher could truly make his or her own curricular decisions for the majority of the content that was included in the units. Some found this limiting. For example, Claire, the social studies teacher, explained,

So a lot of what’s established as curriculum has been decided by a group of three or four history teachers. Calling myself one of the new lights, versus those guys who’ve been around for a while, I’m the one pushing for skills-based, not content-based. And it’s being met with a lot of resistance. So sometimes in the units where they get really emotional and stern, I say, okay, you win. We’ll do it your way. And [this] is one of those units.

Claire explained that some members of her department were resistant to revising curriculum to focus more on specific skills students would master as a result of their study of the unit. Claire explained that she considered herself a “new light” who would like to be more “skills-based,” which meant that she wanted to start by teaching students the skills they could use to learn content instead of focusing on the topics to be covered. On the other
hand, she explained that her colleagues preferred to focus on students’ acquisition of the content. Claire explained that she was working on a curricular team that required her to teach, and test her students on, more content than skills. She explained that because of this, she believed she cannot use her voice with her curricular team, at least not for this particular unit. Because Claire and her team had to use the same content-heavy common assessment they had created, she believed that she did not have the time to teach the students the skills she would like her students to master. She explained that not all the units she taught were this content heavy but that this particular unit focused heavily on the content.

Although Claire, the social studies teacher, mentioned some tension when working with her team to make curricular decisions, other teachers’ collaborations were less tense and more beneficial. For example, Max, the science teacher, mentioned that the group he belonged to based its work on the NGSS and CCSS and they agreed on eight units and the content of those eight units to be taught through the course of the academic year. Max relied on a series of assessments and activities that measured the standards he set out to teach his students.

Occasionally, we [the physics team] vacillate on what’s the right order. We meet in the summer, we discuss it, we tweak it if we need to. And we also do a good job of it [collaborative revision] during the course of a unit and after a unit, saying, you know really there’s one little subcomponent out of here, and put it into a different unit.

Max relied heavily on the decisions made by his curricular team to focus his instruction. He described a team wherein each member’s voice was heard and members reflected and
revised the unit structure as often as necessary. The planning framework that resulted from this collaborative planning guided his instructional decisions.

Similarly, Adam, the English teacher, relied on a planning framework and template that was created based on the standards he was to meet and included categories for skills and texts (various types, including novels, short stories, drama, art, music, and film) with a major focus on the standards and on assessment. Adam explained that the district level team mapped out all of the Common Core Standards in a low, medium, and high level of complexity. And then starting mapping out our year, and I was part of the English one team, Grade 9. We put most of the low complexity standards at the beginning of the year, introducing some medium level, and then the more complex standards. . . . by the end of the year we ultimately ended up with four units.

The result of the team’s work was a curriculum that was vertically aligned within the department and provided guidance to teachers as they were making instructional decisions for their students. Adam commented several times throughout the think-aloud on the usefulness of this tool as he was planning for instruction.

Max, the science teacher, and Adam, the English teacher, each had a team that appeared to decide on a set of standards that students should master and then create curricular guides based on those standards to guide instructional planning. These guides contained a list of the agreed-upon standards, assessments, and content that each teacher would use when planning for instruction. Claire, the math teacher, who also collaborated with her team in order to determine the curriculum they would be teaching, focused on the topic and chapter in the text as her source of curriculum. She then determined what the students needed to know in that topic. For example, she explained,
So we’re starting with systems of equations in the next unit. So they’ll solve them using three different methods . . . [graphing, substitution, and elimination]. So when we do the graphing, because that’s the one we start with, there’s . . . six vocabulary terms that they need to know in regards to categorizing the type of system that they’re working with.

Christina, the social studies teacher, explained the requisite knowledge her students would need to be able to understand successfully the topics presented in that section of her text, which was the source of agreed-upon curriculum the team decided to use with students.

Although all four teachers used the curriculum chosen by their curricular group as a source of content, Adam, the English teacher, and Max, the science teacher, started with a focus on the standards, and Claire, the math teacher, and Christina, the social studies teacher, took a more topical approach, based on the topics and goals decided upon by the curricular group. Clearly, a teacher’s curricular team and the information the team relies on for planning, has influence over the ways in which teachers plan and the content of their units.

In all four cases, the teachers had sources of curriculum that were provided by the teachers’ teams. These sources of curriculum are the basis for the teacher’s unit planning and drive many of the teachers’ instructional decisions. Another influential element in a teacher’s unit planning is his or her knowledge of resources that can be used to facilitate students’ mastery of skills, standards, or content. Using the source of curriculum, the teacher supplements information that can be beneficial in enacting the goals of the unit. Teachers’ ability to do this is dependent upon their own use of text and their text-selection processes.
Assertion 2: Teachers’ Use of Text and Text Selection Was Dependent upon Their Own Knowledge of Resources and Their Sources of Curriculum

During the think-aloud protocol, four prompts were used to ensure consistency in responses across the four teachers and the four disciplines and to ensure that each teacher had a chance to talk about similar aspects of his or her planning process. One of those prompts was designed to encourage teachers to talk about their process of selecting text. If a teacher mentioned a text and did not explain how he or she selected the text, the researcher prompted the teacher by asking him or her to explain the text-selection process. One reason for the selection of this prompt was the importance of learning from text, according to the CCSS, and the importance of text selection when considering what opportunities are available for students as they learn to read and write in the discipline. Allowing students access to authentic texts from which to learn content can help them engage in the habits of thinking in the discipline (Geisler, 1994). Understanding what makes a text valid or worthy of study is as important a consideration in teaching in the disciplines as production and consumption of text is at the heart of disciplinary literacy (Moje, 2007).

Adam, the English teacher, explained that he could use various types of texts in planning his units for instruction. For example, each unit, according to the framework he used, required a central text (either identified as fiction or nonfiction by the curricular team and designed to correspond to the identified CCSS) and supporting texts that included fiction or nonfiction, film, and art. The central text was selected from a list of texts generated by the teams and approved by the board of education. Adam selected texts based
on his knowledge of the central text’s theme but recognized that he was, in some ways, limited by his knowledge of various types of texts in other disciplines and, therefore, relied on collaborations with his colleagues to select the most appropriate text for his purpose.

For example, in the unit Adam planned during the think-aloud, he had a list of four nonfiction texts from which to choose. He had not read two of the texts on the list but was familiar with *Blink: The Power of Thinking without Thinking* (Gladwell, 2005) and *The Man who Mistook his Wife for a Hat* (Sacks, 1998). Adam decided to use Gladwell’s (2005) text as his primary text and to support that with more nonfiction reading from Sacks’s (1998) text. He then decided that he would likely need several texts through the nine-week unit to ensure the students could answer the essential course questions he created for the unit. These questions were directly connected to the goals of the unit and asked students to answer,

1. How do authors construct and support arguments? 2. How do authors examine different perspectives and subjects? 3. How do authors adjust style and format for diverse settings? And how do authors select materials and sources to collaborate and support claims?

Adam explained that he wanted to pull the students in with text so that they would be able to answer those essential questions effectively. He went on to explain how he would use his choice of texts to accomplish this.

It [*The Man who Mistook his Wife for a Hat*] has to do with . . . histories of patients lost in the bizarre. So it talks about neurological disorders. Well, hey, here’s a connection--this one [*Blink*] is about thinking. This one’s [*Man*] about the brain. Let’s see if I can get these two to match. We’ll here’s a greater idea. Let me throw these to the students and let them make the connections. So that’s my plan. *Blink* will be my primary text. I’ll excerpt this [*The Man who Mistook his Wife for a Hat*] text.
Adam went on to explain how and why he would choose other text types such as art, music, and magazine articles, although he did not have definitive texts selected in each area. He had a purpose he wanted the text to serve and then sought to identify the text that would fit that purpose.

*Blink* is going to make many references to other sources. So, just as I did for the previous units, there are going to be nonfiction articles. And I’m gonna say that student and teacher provided. ‘Cause I want be a . . . this is new to me. I’m gonna provide some material. But the burden, the joyful burden, will also be on students to provide [supplemental nonfiction].

Adam explained that by selecting a variety of texts and also having students select and provide some of their own texts to use, he would be helping them meet each of the standards he was to address in the nine-week unit. His choice of text depended upon which standards he was supposed to address with his students. He mentioned that none of the standards in the unit addressed poetry, so he reminded himself that if he was going to teach poetry, he would not want to spend a great deal of time on it but that it was not off-limits.

Adam explained, “I can’t [think of a poem] right off of the top of my head, so I’m just gonna put poems about thinking and that might be enough for me to remember, oh, go check an anthology.” When considering how he might incorporate film into the unit, he stated,

If I’m going to keep it intriguing, probably a documentary. I’m wondering if I could tap into the knowledge of someone in another department. Maybe someone who teaches psychology. . . . Maybe there’s a documentary related to, as this says, neurological disorders. . . . I need to be mindful of why I’m choosing this viewing experience. I think a documentary would feed well into the understanding of nonfiction, but for unit balance, I think it’d be nice to have fiction and nonfiction. I really, at this point, don’t know of any fiction. What was that one movie with Russell Crowe? *A Dangerous Mind?* Maybe a clip of that, . . . ‘cause I’m certainly not going to show the whole thing.
It was clear that Adam relied on his goals and considered his students’ interests when selecting texts. His thinking regarding the texts also aligned to the habits of thinking for those in the discipline of English/language arts as he focused on the form as well as the content of the text when selecting the text (Wilson, 2011).

Christina, the math teacher, approached text selection differently. Although she described that the textbooks for each of her algebra classes were selected by committee, she mentioned that she did use supplemental information from other texts. She explained that there were not enough practice exercises in the texts for the students to be able to complete the problems successfully and stated that she found a supplemental book of exercises that she used with her lower-level juniors. She added that she used the generator of exercises that came with the book for her freshman honors courses. She also mentioned that she wanted to ensure that she included word problems into their courses. She described one as follows,

It’s a current problem, that’s what it will be, where they go upstream and they go downstream. You’ll have the rate of the current, and then you’ll have the rate of your boat, or whatever, that’s floating in the water. And what they’ll do is they’ll say, let x equal rate. And the rate of what? And so getting them to think a little deeper, even though we do it over and over again in class, and I model it over and over again, it’s getting them to do it. So we’re trying to supplement our curriculum with things that we feel would help them.

For Christina, selecting texts involved selecting or creating problems for which the students would need to use the math she was trying to teach in order to solve the problem. Similar to many math teachers, Christina used math problems as her major form of text (Wilson, 2011). Although she did not state it overtly, it appeared that Christina was attempting to address the habit of thinking of modeling with math by using models in her
problems (NGA Center & CCSSO, 2010), but she reserved these types of problems for her upper-level class. The students who struggled practiced more of the math in terms of exercises and other practice that did not necessarily take place in the context of a “real world” issue, as is suggested by the CCSS.

Claire, the social studies teacher, explained that textbooks were selected by curricular teams and these teams viewed several book samples and then decided from those samples, as a team, which book would best meet the needs of their students. Although she was not a part of the process of selecting the book for this course, she had witnessed the book selection for another course’s text and assumed the process was similar. Most of the text that Claire used in this unit included text from this book. She explained how she selected the text that students would read:

And then when I’m going through the book, I think I’m looking for things that are gonna support the test and support student understanding. So even if there’s a section of the book that I’m not asking them to read, or I completely skipped a page, I decided in my historian head that that’s not pertinent information. It’s not only not on the test, but it’s also not essential to grasping the whole gist of the Civil War.

When prompted by the researcher to explain how she chose supplemental texts that she touched on but did not explain during the think-aloud, Claire explained,

[Sojourner] Truth I got in college. . . . I identified with her. So I knew that when I started teaching, I wanted to include her. Not to mention that history doesn’t give the Black woman a voice, ever. So it’s important. It’s very important. And Emancipation Proclamation just is a must. It’s a really important historical document.

She then commented on the use of the textbook and stated,

The biggest challenge with the textbook is that it’s a textbook. I just think most students just don’t always love the textbook. Another challenge with the textbook is that it’s kind of glossy and pretty about history, and that it’s not articulate about
some things . . . So that’s my challenge--when I want to drive home a point, but the book just might barely touch on it.

Claire wanted to select texts that told a more complete story of the history for her students, but she did not necessarily connect that to any particular habit of thinking. She wanted to ensure she included more than the voice of the textbook, but did not connect the choice in text she was making to any particular instructional goal or text during this planning session. Instead, she was selecting texts based on their topical connections.

Max, the science teacher, also described the process he went through in order to select a textbook, and this process appeared to be similar to the process the social studies teacher described. Max explained that though he was not part of the textbook adoption process, the teachers met to determine which of the available books would be a good course text. He explained that he wanted the students to learn from the text: “So the idea here is, let’s practice a heavier degree of reliance on the text. So that’s the primary thing.” He also explained that he and the other teachers have several videos they share, that he relies on websites with interactive information and simulations from universities, and also that he provides his students with laboratory exercises so that they can meet their instructional goals. Max explained that he sometimes used discovery labs and labs that were confirmatory. He explained that a confirmatory lab was a type of lab in which “I’m pretty sure that if I change the mass of an object and I apply the same force, it’s gonna change its acceleration. Yeah. Look that happened. And it happened in a very predictable way. So yeah, labs.” Although he did not like that his curriculum relied mostly on confirmatory labs, he did try to provide hands-on experiences regularly for his students. Many times throughout the unit, Max thought beyond using typical texts as a way to learn, including a
focus on inquiry wherein he presented ideas to students that they questioned and investigated. These texts helped to shape student learning during the unit of study.

Texts play a prominent role in the CCSS (NGA Center & CCSSO, 2010) and are also important to those who are in Discourse communities, as the ways in which texts are consumed and produced help to shape the values these Discourse communities share. Thus, considering teachers’ use of text is an important aspect when considering their disciplinary-literacy knowledge. Also important is a consideration of the influence of a teacher’s choice of instructional text.

Assertion 3: Teachers’ Choice of Instructional Text Is Influenced by Their Own Interactions with Texts

After the think-alouds were completed, the teachers were prompted to “take off their teacher hats” and consider how they themselves engaged in thinking about the texts in their disciplines. The questions posed were designed to gain insight into how the teachers interacted with the texts and how these experiences influenced the opportunities these teachers created for students in their classes. When asked how she interacted with the texts she selected for this unit, how she consumed the texts, Claire, the social studies teacher, explained,

How do I make sense of them? Doing what I try to teach the students to do. Who is saying it? What are they saying? When are they saying it? Put it into context of history. What’s going on in this period of history where, if I can’t make sense of what they’re saying--which does happen quite often--if I can’t figure it out, can I figure it out by context clues? Something that I would do. I find myself having to do that a lot with political cartoons that you know are so clever, but if you don’t get it, if you don’t know this one situation that led to this cartoon, you don’t get it. So you have to--I start absolutely with the political cartoons. I think it’s evidenced ‘cause I don’t bring them in all that much. And there are some great ones that we
should have in history classes. And I personally struggle with them. So it’s unfortunate.

Claire initially spoke of herself as a consumer of text, and the activities she described aligned with the thinking of the experts in the literature. That is, she focused on the author, the message, and the context (Wineburg, 1991). She went on to say that she herself struggled with comprehension of political cartoons, and so she did not bring them into the classroom. Claire’s choices regarding which texts to include in her unit appeared to be influenced by her own interactions with texts. Although asked to answer the interview questions as a consumer of text and not as a teacher, Claire struggled not to include her views of texts as used in her role as a teacher.

When asked which texts Claire regularly read, she explained that she regularly read the school textbook along with her students each year and read several newspapers, both in print and online. She also read several magazines, including Time and The Economist. She also enjoyed reading nonfiction history such as Lost in Shangra-La (Zuckoff, 2012) and Howard Zinn’s (2005) A People’s History of the United States. Claire read texts both in her field and also current popular fiction and nonfiction.

When asked the same question regarding the texts in his own discipline, Max, the science teacher, referred mostly to the textbooks used in his courses and explained that he did not rely on the texts much anymore and did not see himself as a consumer of scientific texts. When pressed to think about his own reading and consuming of texts in the discipline, he explained that the information in the types of material he was reading did not change much, so he relied on his knowledge. He explained,
You know, the frontiers in physics. It’s not like there’s any frontiers. The physics that you’re learning in high school, there’s not too much that’s gonna change on an annual basis. They just discovered another element. And there’s always the argument about are neutrons massless and things like that, so it’s not without mystery, but the curricular goals are pretty black and white.

When considering texts, Max focused on which texts would help students reach their curricular goals. Because high school physics curriculum does not shift much, Max did not focus much attention on reading what he referred to as the “frontiers” of physics. When he spoke of text and consuming text, Max had difficulty seeing himself as a consumer of text and not as a teacher. The researcher pressed on and asked, “When you view the text, do you view it as an argument, or do you view it more as fact?” Max replied,

That’s a good question. And I will tell you from a physics standpoint, I would view it as a factual reference because of the nature of the science. If it were chemistry, I would view it the same way. The experiences that I’ve had with the biology text in the building, it would absolutely be an argument.

Max explained that his views of text were shaped by the subject matter he taught and that he might view text differently if he were a scientist in another field. Max brought up an interesting point: that the content of the discipline, even within the broader field of science, is likely comprised of several different Discourse communities (biology, physics, chemistry) that value and view text differently.

When asked which texts he consumed regularly, Max explained that he tried to balance the types of texts he read among pleasure reading, physics, and teaching or research. For example, he explained that he recently read the novel, *The Adventures of Augie March* (Bellow, 2006) and *The First War of Physics: The Secret History of the Atom Bomb: 1939-1949* (Baggott & Baggott, 2010). Max also regularly read journals such as *Physics Today* and *Educational Leadership*. 
Initially, Christina, the math teacher, also had a difficult time thinking of herself as a consumer of text when asked how she interacted with the texts in her discipline. She explained,

In math, it’s more technical, what they would be doing. It’s more like a technical reading. It’s not reading like you would get in your [English] classes. So you have to actually teach them the more technical reading part of it, which we don’t, necessarily, like, this is how you solve it step by step, the written word how to do it. ‘Cause it’s not written in full sentences.

The researcher pressed, “So do you think that way? If you were to encounter a new text or problem?” Christina responded,

I do ‘cause I have that ability. You know what I mean? I can look at it and say, okay, Step 1--and other students can do that. But does that come with a reading level? I don’t know. Where does that come from? The kids who can do it are usually pretty high functioning. I could also give them something independent. And they could figure it out themselves because they have that reading or ability to problem solve, critical thinking. That just doesn’t come naturally.

Christina articulated that there was a manner in which successful students, including herself, interacted with the texts of her discipline. She had a difficult time explaining exactly what she did and how to successfully interact with the text, but she recognized that the students who were able to see the steps and understand how to comprehend the technical nature of the text were more successful.

When asked what types of texts she read on a regular basis, she explained that she watched many videos when preparing to teach so that she could learn from these videos how other teachers taught specific mathematical concepts. She also explained that she regularly read her textbooks when preparing for class. She explained that as a mother of a young child, she did not read much beyond children’s books outside of her preparation for class.
As did the other teachers, Adam, the English teacher, had difficulty seeing himself outside of the role of teacher. When asked how he consumed texts, he explained that he looked to the texts that he was reading with or for his students based on their choices. And he was reading with the lens of its “usefulness, its relevance.” When he was asked if he relied on any strategies for himself as a reader, he asked, “For unlocking its meaning? Not really; I think it’s difficult for me to pin down a strategy because my acquisition of the literature also varies.” Adam went on to explain that owning the book or borrowing a library book controlled whether or not he was able to write in the text or whether he was consuming the text as an audiobook. Adam focused his interactions and strategy use only on his ability to unlock meaning and not on discipline-specific strategies suggested by the CCSS, such as analyzing an author’s choices and the impact those choices have on the meaning of the text (NGA Center & CCSSO, 2010).

When asked what types of texts he consumed, Adam explained that he read the texts as his students were reading texts. These texts included novels, memoirs, plays, and nonfiction memoir, poetry and short stories, and journalistic pieces of nonfiction. Adam explained that he personally enjoyed audio books as he commuted to work and reading issues of *Educational Leadership*. Adam also gathered many sources and ideas from Twitter.

Each teacher had a slightly different process of selecting texts for his or her courses. These processes were informed by teachers’ own interactions with texts and knowledge of resources that connected to their purpose for instruction. For example, although Max brought in several labs and interactive websites to help his students meet his instructional
goals, he did not bring in supplemental texts regarding new developments in physics because he did not see a place for these texts in his curriculum. Adam relied on the identified focal genres in his curricular guide to select texts he believed would engage his students in their reading. Claire did not bring in texts with which she was uncomfortable, such as political cartoons, but she did include supplemental texts that connected with the topic she and her students were studying. Christina brought in supplemental texts, such as equations and word problems, when she anticipated that her students might need more interactions with the text in order to master the goals of the unit.

Furthermore, the teachers might or might not read the texts that were valued by their Discourse communities. Christina did not report reading texts beyond children’s books to her young child and materials necessary for her courses. Claire did read historical texts but did not engage in the reading of texts with which she was uncomfortable. Max and Adam both read within their disciplines and texts based on pedagogy. Each teacher’s own interactions with text and his or her view of text did influence the decisions he or she made when planning a unit for instruction.

The teachers in this study relied on their sources of curriculum, their knowledge of resources, and their own interactions with texts to shape learning experiences for students within the unit. The teachers in this study also relied on their instructional goals, which they based on their identified assessments, when planning units for instruction.
Assertion 4: Teachers Base Their Instructional Goals on Their Identified Assessments

There are many advocates of backwards design as a planning framework (Wiggins & McTighe, 2005). When one uses a backwards design framework, one identifies the desired outcome and determines how students can demonstrate mastery on that outcome. The teacher, or team of teachers, then collaborate to create a task that assesses whether or not students have met the identified outcome. In this study, the teachers who had a clear sense of the specific goals of the units used assessment to guide their instruction. On the other hand, the teachers who used their course texts as sources of curriculum did not rely on their assessments to guide their curricular decisions and, instead, considered the assessments at the end of the unit.

Max, the science teacher, explained that he used the assessments as a guide for how to plan for instruction to ensure that students met the goals. First, he gave students a pretest to determine how he could provide individualized and targeted experiences for students who might be in different places in their content knowledge. He explained, “I take these four learning goals, and I design--we design--we try to enhance, whatever, an assessment that says, where do you stand? Before you even start, where do you stand on these?” He then described how he provided students with a pretest, to determine their current skill level, and then a posttest, which shared the same topics and goals as the pretest, to see where the students were in relation to the goal(s) of the unit. He then defined instruction and activities that would allow his students to meet the instructional goals. Similarly, Adam, the English teacher, who had limited, clearly stated instructional goals, designed
assessment and instructional opportunities that targeted, specifically, the skills presented in the standards. He explained,

The four guiding questions--and this is when I’m planning, I need to have this in mind, this is the lens through which I need to see. If I find content that I love--"Oh, I love this book! I can’t wait to teach this book"--if it doesn’t address the standards, it doesn’t fit anymore.

Adam’s focus on assessing and crafting instruction for his students connected back to the standards, and he used those standards to guide his decisions. In fact, he mentioned the standards 48 times in the time he spent planning (as compared to 6 mentions of the standards/goals by the math teacher, 19 mentions of goals by the science teacher, and 2 mentions of goals by the social studies teacher).

Although the social studies teacher did not mention official standards frequently, she had an innate sense of what she wanted her students to know. She had difficulty articulating what her specific instructional outcomes were and explained this in the interview:

R: If I could, I’d like to ask you to clarify the major objectives for the unit. What’s the end game?

C: Do you want the polished up versions that I would put on a lesson plan or use to build your curriculum?

R: Sure. That, or whatever is in your head.

C: Okay. I have the ones in my head, what I want students to know. But I also just know that I’ve already written some pretty good ones. . . . At the end of the section, I want students to understand those objectives, is that what we’re talking about?

R: Yes.

C: Factors that divided the nation, so that we understand factors that can divide a nation, or factors that in fact did divide our nation. . . . And we’re talking
about advantages and disadvantages. . . . And I’m just gonna throw the word “sectionalism” in there. I want them to understand--I want them to love the Civil War [laughter]; I want them to love it. A big thing to grasp is cause and effect.

Claire went on to explain that she wanted her students to have an understanding of the cause-and-effect relationships of the battles in the Civil War. She mentioned that she created activities and lessons to check on her students’ learning. Because Claire was uncertain about her instructional objectives, other than having a broad sense of knowing what she would like her students to gain from their experiences in the unit, Claire had a difficult time articulating what it was that she wanted her students to know and to be able to do. A similar pattern emerged during the math teacher’s think-aloud.

Christina, the math teacher, mentioned her goal early in the think-aloud, yet the goal was not attached to any particular standard that she stated overtly. She also wanted the students to self-assess. She mentioned formative assessments multiple times and that she used those formative assessments to guide her instruction. Again, she focused on the topics for study and did not spend much time determining what student performance on those particular topics would look like in terms of meeting those goals successfully.

Clearly, a teacher’s knowledge of specific instructional objectives and an identified outcome for those objectives influenced the decisions teachers made as they organized units for instruction. The content knowledge these teachers had, as well as the knowledge these teachers relied on when planning lessons for instruction, informed the decisions they made regarding their instructional planning. But just as students learn the content by engaging in the same habits of thinking as the experts in the field to learn on the diagonal, teachers also must have expertise in their content knowledge and their pedagogical content knowledge to
provide these experiences for students (Shulman, 1986). Therefore, a study of a teacher’s planning process would not be complete without an investigation into how the teachers make the decisions that they make as they plan for instruction. It is clear, through the findings, that this process is multifaceted and complex.

Assessment 5: Teachers Rely on Complex Skills When Designing Units for Instruction

To the untrained eye, it can appear deceptively simple to organize a unit for instruction. However, these teachers relied on several complex skills implemented in tandem when designing units for instruction. First, the teachers considered their content. As explained earlier, the sources of the content might vary (e.g., some teachers used instructional goals, and others based their unit information on the textbook). Each teacher also actively made decisions regarding which texts to use and when and how to use them and considered what the students already knew and what mistakes they might make when learning new information. Teachers also considered what might be challenging about the content in their particular unit of instruction.

All this information was then synthesized, and then the teachers made decisions regarding the instructional methods he or she would use. Although no teacher created a script of how to address each individual lesson, it was clear that each lesson would include a goal (whether or not this goal was shared with students), an activity or delivery of content (variety of ways), and an assessment, whether informal or formal. Although understanding the knowledge domains that teachers possess provides insight into the type of information on which teachers rely when planning units for
instruction, it is also important to consider the behaviors in which teachers engage when planning units for instruction. After the researcher created axial codes for the types of knowledge on which the teachers relied, she recoded the data to identify the behaviors in which the teachers engaged as they planned units for instruction in order to inform how the teachers planned, not just what information they were using to plan for instruction.

Examining the behaviors in which the teachers engaged when planning lessons for instruction allowed insight into what the teachers were doing as they planned for instruction, as well as how they used the knowledge they possessed. It was clear that lesson construction is complex, requiring the use of knowledge from various domains. Determining what and how teachers use knowledge can inform both teacher and professional-development provider practice.

In the study, the teachers’ reliance on specific skills varied. Shulman’s (1986) theory of pedagogical content knowledge states that teachers consider students’ knowledge and misconceptions of a given topic and plan instructional in such a manner that these concerns are addressed. Each teacher varied in the amount of time he or she engaged in this type of thinking. For example, the math teacher considered students’ misconceptions 19 times, but the English/language arts (four times), science (five times), and social studies teacher (seven times) did this less often.

The most frequent behavior in which the teachers engaged was referencing materials and sources of curriculum. For example, Adam, the English/language arts teacher, referenced his goals and sources of curriculum 33 times, but Christina, the math teacher, did this 24 times; Max, the science teacher, 18 times; and Claire, the social studies teacher, 14 times. The data also revealed that teachers often used knowledge from multiple domains. For example, the science teacher referenced knowledge from the social studies and math domains 20 times, while the English/language arts teacher referenced knowledge from the science and math domains 15 times. This suggests that teachers integrate knowledge from various domains to create effective lessons.
teacher, 23 times. Clearly, the source of curriculum was an essential component of these teachers’ planning process and can, therefore, be influential on the instruction that is ultimately passed on to their students.

Another process in which all the teachers engaged was their own reflection that would allow them to either affirm or reject an idea as they planned for instruction. This ability to reflect is essential, as it can shape and refine instruction from year to year and even unit to unit.

Other considerations in which teachers engaged included what had been taught previously in a unit. This consideration also influenced their decisions regarding what to include in the current unit for instruction. For example, Adam, the English teacher, considered the variety of texts that were utilized in his unit and worked to ensure that students received a balanced amount of text types from one unit to the next.

Another thought process commonly utilized during the planning process was considering and selecting appropriate instructional and/or literacy strategies. For example, Claire, the social studies teacher, realized that students needed to use a graphic organizer to record notes or they might forget the information they were reviewing as a whole group. She identified that the students needed a note-taking strategy and then decided on the specific graphic organizer she would use.

This examination of the behaviors in which teachers engaged offered insight into teachers’ planning practice. Although each teacher had a different style of planning, they each utilized common elements when planning for instruction. The teachers relied on their knowledge of curriculum, resources, interactions with texts, and use of assessment to guide
instruction. Further, the teachers relied on similar skills when planning, though to varying degrees. That is, each teacher considered students’ knowledge and/or misconceptions, referenced materials and sources of curriculum, engaged in reflection to affirm or reject an idea, considered content from a previous unit or lesson, selected instructional or literacy strategies, considered the sequence of instruction, and addressed a habit of thinking, whether it was overtly stated or implied. Although each teacher engaged in these behaviors when planning, the degree to which they engaged in the activities varied. Frequency counts for each of these behaviors are reported in Table 19. Although each of these behaviors utilized in planning are important, essential to the research questions presented in this study is whether or not the teachers considered the habits of thinking required by a disciplinary-literacy approach to instruction when planning for instruction.

Table 19
Frequency Counts

<table>
<thead>
<tr>
<th>Code</th>
<th>Frequency Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Considering students’ knowledge and/or misconceptions</td>
<td>4</td>
</tr>
<tr>
<td>Referencing materials/texts/sources of curriculum</td>
<td>33</td>
</tr>
<tr>
<td>Reflecting, leading to, affirming, or rejecting an idea</td>
<td>5</td>
</tr>
<tr>
<td>Considering content from a previous lesson or unit</td>
<td>8</td>
</tr>
<tr>
<td>Selecting instructional and/or literacy strategies</td>
<td>8</td>
</tr>
<tr>
<td>Addressing a habit of mind (overtly stated or implied)</td>
<td>6</td>
</tr>
<tr>
<td>Considering sequence of instruction</td>
<td>5</td>
</tr>
<tr>
<td>Totals</td>
<td>69</td>
</tr>
</tbody>
</table>
Habits of Thinking

An important element of this study was to examine whether or not teachers planned to or did address these habits of thinking as identified by the CCSS (NGA Center & CCSSO, 2010) and the literature on disciplinary literacy. This was an important consideration because, if a teacher plans for this during instruction, it is likely that these plans will make their way into the classrooms and translate into opportunities for students to engage in these habits of thinking.

Again, he and the other teachers may have mentioned other habits of thinking in the interview, but the utterances included in the frequency counts include only what he referred to during his think-aloud when planning. The first habit of thinking Adam addressed was investigating how authors craft prose and arguments. He wanted his students to be able to cite evidence and focus on the theme present in the text. He also wanted them to consider varied perspectives when he thought, “What am I gonna have to do? I’m gonna have to bring my students to different perspectives and subjects.” Although he did not explain how he would do this, he made it clear that this was an expectation of learning in the unit.

During the think-aloud, Adam also wondered how he could foster this type of critical thinking: “How do authors select materials and sources to collaborate and support claims? We want them to be a wiser, more discerning shopper, of course, not just grab the first thing they see, to support your claim.” This consideration of appropriate evidence is another value held by those in the field of English/language arts and that Adam wanted to provide an opportunity in which his students could engage. Finally, Adam mentioned that he would like for his students to read for information and make sure they “delineate and
evaluate the argument.” In this case, Adam did not explain what he meant by this or how his students might go about doing this. He simply stated it as a goal that he hoped his unit would address.

Christina, the math teacher, also included some of the habits of thinking into her unit plan as well. For example, one of the behaviors in which she wanted her students to engage was the process of error analysis. She thought, “I have to get them out of the step-by-step, . . . get them to not just do it the way I do it.” She also mentioned that she could ask her students to “do a quick sketch” to help build an understanding of the problem they were attempting to solve. Finally, Christina also mentioned wanting to provide time for students to practice providing explanations for their answers. She wanted them to justify their answers and their process, which are also both values expressed in the mathematical practice standards (NGA Center & CCSSO, 2010).

Max, the science teacher, also included some of the scientific habits of thinking during his think-aloud of unit planning. First, Max wanted to ensure that his students would be able to explain why a phenomena happened and not just what happened. He also wanted students to be able to refine their scientific thinking by considering how scientists--in this case, Newton and Galileo--contributed to their understanding on the topic of motion. Throughout the think-aloud, Max also thought about avenues by which students could observe and then explain their observations. Max wanted to ensure that students would be able to hypothesize the reasons for the occurrence they observed. These activities aligned with the scientific habits of thinking required by the CCSS and reflected in the literature on disciplinary literacy.
Claire, the social studies teacher, also included some aspects of historians’ habits of thinking in her think-aloud as well. For instance, she wanted to ensure that students were able to identify causes and effects and support those causes and effects with evidence. She explained, “So they have to determine the cause and effect--and that’s from the text, so it is text dependent.” She also wanted them to be able to interpret images and infer meaning after considering more than one text on a topic. She explained that she wanted to ask her students to, “Look at the two pictures side by side and see that there are two hospitals. . . . What do the pictures show you?” This reflected her desire to ask students to consider more than one text to build an understanding of a topic.

Each teacher did address throughout their think-aloud at least one habit of thinking represented in the CCSS and the literature on disciplinary literacy. Frequencies for these habits of mind and for all the behaviors in which the teachers engaged are found in Table 19.

Considering how teachers construct units for instruction as well as the knowledge upon which they rely when planning for instruction provides insight into teachers’ planning process. This information can help preservice teacher educators and professional-development providers as they make decisions about how best to support current and future teachers as they work to enact curricular reform, specifically the implementation of the CCSS and a discipline-specific approach to literacy instruction.
Conclusion

In this chapter, data were described and analyzed. The data collected from the survey were analyzed through a review of descriptive statistics, factor analysis, MANOVA, and post-hoc testing. The process for analyzing the qualitative data gathered from the think-alouds and semistructured interview was described, and assertions described in detail both what knowledge teachers relied on when planning lessons for instruction and the behaviors in which the teachers engaged. In the next chapter, the findings are interpreted. In addition, areas for future research are considered.
The research that identifies the habits of thinking embedded into the disciplines has been informed by expert-novice studies. These studies illuminate the behaviors in which experts engage when interacting with the texts valued in their respective disciplines. The premise of disciplinary literacy is built around these practices. The experts who have participated in these studies are either doctoral candidates or hold terminal degrees in their field of study (e.g., Shanahan et al., 2011; Wineburg, 1991).

Participants in these studies are considered experts in that they have knowledge that goes beyond competence in the field (Geisler, 1994) and perform in the field at a level that is superior to others (Feldon, 2007). The expert-novice studies in which these experts participated provide insight into the values shared by their respective Discourse communities. For example, scientists do not read text in a linear fashion. This is because they understand which sections of the text would be the most essential to read first to gather information (Bazerman, 1985; Charney, 1982) before reading the author’s argument. Historians focus on understanding the context in which and about which the text was written and view each text as an argument a historian is making and not as factual evidence (Wineburg, 1991). In the field of English/language arts, scholars focus on form as well as content as they interact with the texts in the discipline (Peskin, 1998). In math, the experts
interpret graphics and text simultaneously and place a great deal of emphasis on accuracy of information (Shanahan et al., 2011). In the literature, it is clear that there is a distinction in disciplinary reading practices, and this distinction is supported by the demands of the CCSS in the disciplines. Therefore, it is important to consider the knowledge high school teachers report to possess as well as the knowledge they utilize when planning for instruction in order to determine if teachers can be successful in translating disciplinary-literacy instruction to students.

In an attempt to unpack the knowledge teachers report to possess and the knowledge domains and behaviors on which teachers rely when planning for instruction, a mixed-method study was conducted. A survey measured the knowledge teachers reported to possess, and a comparison of this knowledge was made across disciplines using a one-way MANOVA, and a think-aloud protocol and semistructured interview afforded insight into teachers’ planning practices. This study provides insight into teachers’ current practices and possible avenues for professional-development providers and preservice teacher educators to foster a disciplinary-literacy approach to instruction that can also support the implementation of the CCSS (NGA Center & CCSSO, 2010). The findings in this chapter suggest that although teachers possess varying degrees of disciplinary-literacy knowledge, this knowledge is not yet integrated into instruction. A model of teachers’ application of knowledge to the planning process emerged from the data analysis, and a framework for professional development was created as an approach to guiding teachers’ planning process in a way that allows them to enact curricular reform (this model and framework are
addressed more thoroughly later in this chapter). In this case, specific information regarding reform geared toward disciplinary-literacy instruction is included.

In order to consider whether or not high school teachers have habits of thinking and knowledge that are similar to those of experts and whether they use this knowledge when they plan lessons for instruction, 311 high school English/language arts, math, science, and social studies teachers in the northern region of Illinois completed a survey designed to measure high school teachers’ disciplinary-literacy knowledge and instructional practices. Four of these teachers, representing different high schools in the sample, also participated in a think-aloud of unit construction and a semistructured interview. These four teachers, Claire, Christina, Adam, and Max, bring between 7 and 19 years of teaching experience to their planning.

In the following sections, the data that were explored in Chapter 4 are analyzed and interpreted in light of the findings, conceptual framework, and the review of the literature. A model of teachers’ application of knowledge to the planning process that emerged from the data is also explored and supported by the findings. This theory informs both preservice teacher educators and professional-development providers as they attempt to collaborate with preservice and inservice teachers who are working to implement standards that require a discipline-specific approach to literacy instruction.

Discussion of Findings

The theory of disciplinary literacy requires teachers to possess two types of domain knowledge, content and process knowledge, in order to transfer disciplinary habits of
thinking to students. Teachers need to utilize this knowledge to teach on the diagonal (McConachie, 2010). When one teaches on the diagonal, he or she is providing students with opportunities to engage in the habits of thinking required by the discipline as they learn the content of the discipline. That is, the teacher uses the values of the discipline’s Discourse community to promote active engagement with the texts that are valued by the discipline. For example, a history teacher might provide students with a text set of multiple text types regarding the New Deal, including newspaper accounts, photographs, news clips, and historians’ arguments on the topic. The teacher can then teach students how to contextualize the documents, source the documents, and consider the author’s perspective and point-of-view as they interpret the documents. It is from these interactions that students can learn about the New Deal and the role of this and other governmental programs in society.

The knowledge required to teach on the diagonal successfully is often tacit and represents shared values among people who participate in Discourse communities. To possess the knowledge requisite to teaching on the diagonal (McConachie, 2010), teachers must have subject-matter knowledge, topic knowledge, and knowledge of the fundamental concepts that differentiate this field of study from others (Alexander et al., 1995). This knowledge informs but does not guarantee one’s knowledge of the values of producing and consuming knowledge in the field. To understand the values of text production and consumption in a given field, one would be a member of a Discourse community and, as such, would possess tacit knowledge specific to the group (Gee, 2005).
It was important to determine whether or not high school teachers possess knowledge similar to those experts in the field who guide the disciplinary-literacy studies, as current standards reform requires this approach to instruction, and the only way to ensure that reforms are successful is to ensure that the teachers have the knowledge to enact them as part of their curriculum (U.S. Department of Education, 2010). It was also necessary to examine whether or not teachers’ disciplinary-literacy knowledge was integrated into their lesson design.

Because teachers’ disciplinary-literacy knowledge may be tacit, a survey with items designed to help teachers consider their knowledge was created. The responses to the survey provided insight into high school teachers’ disciplinary-literacy knowledge and served to answer the first research question regarding the type(s) of domain knowledge high school teachers in four Discourse communities (English/language arts, mathematics, science, and social studies) possessed. Specifically, this survey sought to determine whether teachers possessed disciplinary-literacy knowledge as it is represented in the literature.

High School Teachers’ Disciplinary-Literacy Knowledge

Conducting a factor analysis allowed the researcher to consider the teachers’ responses to items designed to measure disciplinary-literacy knowledge in a more streamlined manner. The four factors that were retained are discussed in this section.

The first factor involved teachers’ confidence in students’ abilities to engage in the habits of thinking that might be addressed in several of the disciplines. Many of the items
in this factor involved students’ use of and interaction with texts. These items included students’ ability to use evidence from text, draw conclusions about text independently, cite evidence to support an idea, compare approaches taken by two or more authors on a text, and analyze the development of an event or character over time. These habits of thinking are also represented in the CCSS (NGA Center & CCSSO, 2010).

English/language arts and social studies teachers did not differ significantly in their confidence in their students’ abilities to engage in the tasks that loaded into this factor, but they did differ from science and math teachers with regard to their confidence in students’ abilities. The English/language arts and social studies teachers were more confident than the science and math teachers. Interestingly, no teacher from any discipline was very confident that students could engage in the habits of thinking represented by items that loaded into this factor. This suggests that teachers require support through professional development in teaching students how to engage in the habits of thinking in their respective disciplines because there is evidence that suggests that students are able to engage in the habits of thinking when given the opportunity to do so (e.g., Manderino, 2012; Monte-Santo et al., 2014).

The third factor also reflects on teachers’ confidence, in this case, their confidence in providing students with instructional opportunities to engage in the habits of thinking of the discipline. Interestingly, teachers did not report a great deal of confidence in students’ abilities to engage in the habits of thinking but did have confidence in their own ability to provide these experiences for students.
For example, the teachers reported confidence in selecting texts with diverse formats and creating text sets for students to use to answer questions independently. The teachers also reported being fairly confident that they could teach students to use more than one text to verify an idea and to use more than one type of text when building an understanding of a topic. Investigation into this discrepancy would provide insight into why teachers reported being confident in providing experiences to students to engage in the habits of thinking but less confident in their students’ ability to engage in those habits of thinking. Professional development may be necessary to help teachers consider how to scaffold learning experiences for students so that they can engage in the opportunities teachers provide.

The second factor involved items that measured teachers’ own views of authors and texts. A reader’s view of the author is one of the fundamental aspects of disciplinary literacy (Shanahan & Shanahan, 2008). English/language arts and social studies teachers did not differ significantly on these items, but math and science teachers did differ from one another and the social studies and English/language arts teachers. The items that loaded into this factor include whether or not one considers an author’s point of view when reading, views the text as an argument that the author is creating, views texts as a source of factual information, or considers the context and author to interpret the text and determine whether or not the source is credible. Although English/language arts teachers reported engaging in this type of thinking quite frequently, math and science teachers reported that they did not engage in this type of thinking as frequently.
Perhaps the most interesting item that loaded into this factor was whether or not teachers viewed texts as a source of factual information. English/language arts teachers ($M = 4.1, SD = .99$), math teachers ($M = 4.1, SD = .85$), science teachers ($M = 4.3, SD = .49$), and social studies teachers ($M = 4.2, SD = .66$) reported being likely to consider the text as factual information. This does not align with the experts’ habits of thinking in social studies (Wineburg, 1991) or science (Bazerman, 1985). This suggests that teachers, at least in the disciplines of science and social studies, may not have the same views of text as the experts in the expert-novice studies indicated having regarding their view of text as an argument versus a source of factual information. Thus, these teachers may belong to a Discourse community of secondary subject-matter educators but may not belong to a Discourse community of historians or scientists.

Because teachers’ views and philosophies influence their ability to teach for disciplinary-literacy instruction (Monte-Santo et al., 2014), teachers must work to expand their own thinking about text before they can be expected to take the practice of viewing text as argument to the classroom. Some promising approaches to preservice teacher education, such as the work at the University of Michigan (Bain, 2012), which offers preservice history teachers the opportunity to engage in thinking the same way a historian thinks for three semesters, which attempts to foster the knowledge and philosophy necessary to engage in teaching the habits of thinking to students. Courses such as these for all disciplines could help broaden teachers’ views of texts.

Items that loaded into the fourth factor considered teachers’ own use of general strategies. English/language arts teachers differed from math teachers and science teachers
but not from social studies teachers. There were no other differences among the groups of teachers. The items that loaded into this factor included previewing the text prior to reading, setting a purpose to read the text, and using the structure of the text to aid comprehension. Teachers in all disciplines reported being likely to engage in these activities or use these strategies, but there was a statistically significant difference among the teachers in the various disciplines. This indicates that there is evidence that the teachers were likely to use these strategies to varying degrees.

The teachers who responded to the survey reported engaging in some of the habits of thinking in which the experts in the field reported to engage. Nevertheless, the habits of thinking were not regularly reflected in the teachers’ unit planning. It is possible that the teachers were more aligned with the construct of experienced nonexperts, as described by Bereiter and Scardamalia (1993), and not as experts. Experienced nonexperts carry out routines but do not address problems in the field (Bereiter & Scardamalia, 1993). The difference in the activities allows the experts the opportunity to think about texts when they use them in a different way from when they only consume the texts.

It may be that some high school teachers have not yet had the opportunity to engage with text in this manner and thus are not yet members of the Discourse communities of their respective disciplines. Future research could determine whether or not teachers are more aligned with the experts’ thinking or more aligned with the thinking of experienced nonexperts. By providing teachers with opportunities to engage in the practices of the experts, researchers could determine if teachers’ shift their practice as a result of these
opportunities. Then teachers may also become members of the Discourse community in their respective disciplines.

An important consideration when planning these professional-development experiences is that planning needs to be aligned with teachers’ specific disciplines. Just as the requirements on students’ developing literacies become more nuanced and more complex as they continue through school, the skills and experiences teachers must provide also become more complex and more nuanced. Thus, any professional development aimed to foster teachers’ abilities to teach students the habits of thinking in the discipline should be specific to the demands of that discipline. With this targeted professional development, teachers may be able to negotiate their participation in the Discourse community of their discipline as well as the Discourse community of secondary teachers of subject areas.

Considering how teachers in the various disciplines responded to the items that loaded into all of the factors provides insight into the knowledge they reported to have and the knowledge they might use when planning lessons for instruction. This information is most useful when compared to the findings from the expert-novice studies, so in the following sections, the responses from the teachers are compared to the practices of the experts and the demands of the CCSS.

**High School Teachers’ Knowledge as Compared to the Experts in the Expert-Novice Studies**

An overview of teachers’ responses to the items that loaded into the factors is provided. Then, these responses are compared to the habits of thinking found in the expert-novice studies and the demands of the CCSS, as reported in the literature.
English/Language Arts

Peskin (1998) reports that the experts in the field of English/language arts relied on allusions to other texts and the structure of the text to aid comprehension. English/language arts teachers in this study reported that they were likely to use the structure of text to aid comprehension ($M = 4.4, SD = .70$). This indicates that English/language teachers are similar to the experts in that they rely on text structure to aid comprehension. Nevertheless, when asked, Adam, the English teacher in the study, explained that he did not rely on any strategies to unlock meaning when he was interacting with text. Thus, the survey data could not be corroborated with the think-aloud and semistructured interview data on this item.

Further, the CCSS require that students use texts to support claims and build and support arguments. In this survey, English/language arts teachers reported that they were likely to view the text as an argument ($M = 4.3, SD = .74$). The English/language arts teachers also reported being confident ($M = 4.0, SD = .93$) that their students were able to use evidence drawn from text. English/language arts teachers’ reported that knowledge and beliefs do align with the CCSS, as reported in the survey. Nevertheless, Adam, the English teacher, referred to the demands of the CCSS, which included the habits of thinking illustrated by the experts, only six times when he was planning for instruction and instead focused on more general strategies when considering his lesson plans. This suggests that although teachers may report to engage in the habits of thinking, these practices may not be transferred to students during instruction. Further, when Adam did mention the habits of thinking, he did not describe how he would teach these skills to his students; rather, they
were mentioned as goals. Perhaps teachers require professional development in how to use the knowledge they have in their discipline and transfer that practice to knowledge for students in a manner that is specific to the demands of studying English/language arts.

Shulman (1986) argues that teachers require subject-matter knowledge, curricular knowledge, and pedagogical content knowledge. Perhaps, instead of subject-matter knowledge, teachers may require disciplinary-literacy knowledge—including knowledge of both the content and the valued processes of obtaining and critiquing that knowledge—within their discipline in order to provide instruction to students. Furthermore, teachers require declarative, conditional, and procedural knowledge (Alexander, 2003) within that knowledge domain so that they can translate this into opportunities for students. Adam had declarative knowledge as he knew what it was he wanted his students to be able to do, but he did not express whether or not he had procedural or conditional knowledge when planning for instruction. Thus, it is uncertain whether or not Adam was a member of the same Discourse community as members of his discipline are.

**Mathematics**

In the field of mathematics, the experts in the expert-novice studies reported that mathematicians relied on the interpretation of graphics and texts in a unified manner (Shanahan et al., 2011) and on texts that were a complex set of symbols (Wilson, 2011) but did not contextualize texts (Shanahan et al., 2011) when interacting with the texts in the discipline. Christina, the math teacher in the study, did seem to engage in some same habits of thinking as the experts in that she did view equations and problems as text and did not
think of the texts in her discipline as traditional texts that one would read in a linear fashion. Christina did not mention needing to contextualize text, and the teachers in the survey reported that they were unlikely \((M = 2.7, \text{SD} = 1.2)\) to contextualize text as well.

Christina did attempt to provide her students with real-world models, as required by the CCSS, but did not provide this experience for the students who struggled. Similar to Adam, Christina did not mention how she would teach her students how to engage in the habits of thinking. During her think-aloud, Christina mentioned that she would include real-world models in her instruction but did not elaborate on how she would instruct her students to use those real-world models and explained that only her freshman honors students would use these models. It was clear that Christina wanted to include instruction that provided her students with the opportunity to engage in mathematical thinking in a manner similar to the thinking in which mathematicians engage. However, because she did not provide a sense of how she would go about instructing these students, it is unclear whether or not students would be successful in engaging in these activities. Similar to Adam, Christina indicated that she possessed declarative knowledge in that she knew what she wanted her students to be able to do but did not consider procedural or conditional knowledge when planning disciplinary-literacy instruction for her students. Because Christina did utilize domain knowledge and disciplinary-literacy knowledge in her discipline, it was unlikely that she was a member of the same Discourse community as the expert mathematicians in the expert-novice studies.
Science

According to Charney (1991), scientists engage in specific habits of thinking as they interact with text. For example, they preview the text so that they understand the concepts presented. This allows them to view the text as an argument an author is making. This attempt to understand what the text is saying and not to become lost in the rhetoric is also why scientists read text in a nonlinear fashion (Bazerman, 1985). Determining the information presented in the text is another main habit of thinking in which scientists engage when reading texts, yet teachers in the survey reported being less confident that their students could read texts to determine information presented ($M = 3.3, SD = .92$). The science teachers also reported that they did preview the text prior to reading ($M = 3.9, SD = 1.1$) but were not likely to view the text as an argument ($M = 3.0, SD = 1.0$). Although the teachers did report previewing the text, they did not report previewing texts in order to ensure they viewed the texts as arguments, as the experts did. It appeared that the teachers responding to the survey did not engage in all the same habits of thinking as did the experts in the literature.

During the semistructured interview, Max stated that there are no new frontiers in high school physics, so he did not view the texts with which his students engaged as arguments. He did state that the ways in which people read about science was impacted by the field of science he or she studied. He mentioned that there may be more arguments in biology but that the majority of concepts high school students encountered in physics were more factual in nature. Future research that compares how scientists in the various fields of science interact with text may lend insight into the specific demands of these disciplines.
Max, a physicist, did not view texts as arguments. Thus, it was unlikely that Max would teach his students to engage with texts in this manner. Therefore, targeted professional development that would provide Max with the opportunity to teach his students to think of the texts in which they engage as arguments would be beneficial. That is, if Max were afforded the opportunity to engage in the habits of thinking in the discipline, he could then create these same opportunities for his students.

Social Studies

In the expert-novice studies in the field of social studies, novices viewed text as information gathering/presenting instead of viewing texts as one person’s point of view and argument, as the experts did (Rouet et al., 1997; Wineburg, 1991). Experts also paid attention to the source and context of the text and used this information to construct meaning (Rouet et al., 1997; Wineburg, 1991). It was also determined that experts considered the author’s perspective when interpreting text (Shanahan et al., 2011).

Social studies teachers in the survey reported that they were likely to view the text as an argument that an author was making ($M = 4.1, SD = .89$). This reported thinking aligns with the habits of thinking in which experts engage. Also, the social studies teachers considered the viewpoints of the authors when interacting with texts ($M = 4.5, SD = 8.6$), as well as the context of the text ($M = 4.6, SD = .60$). The social studies teachers reported being likely to consider an author’s point-of-view, viewing the text as an argument the author was making, and considering the context of the text when interpreting the text; thus, they are aligned in sharing habits of thinking similar to those of the experts. Interestingly,
these teachers also viewed the texts as sources of factual information \((M = 4.6, \ SD = .60)\), which was a sentiment that none of the experts in the expert-novice studies reported. Thus, it was not likely that these teachers would belong to the same Discourse community as the experts in this study.

Results from the survey indicate that teachers reported having some knowledge of habits of thinking in the domain. Nevertheless, this knowledge needs to make its way into the planning for instruction in order to be fully integrated. Claire, the social studies teacher, also viewed the text as factual. In fact, she based her lessons on using the textbook and the topics presented in it and even considered her supplemental text selection based on the topics present in the text. If Claire had the opportunity to engage in critiquing the arguments made in the textbook, she might be able to further align her thinking with the thinking of the experts.

Understanding the knowledge that teachers reportedly possess and the relationship between that knowledge and the ways in which experts engage in habits of thinking in the discipline provides insights into the likeliness of teachers enacting curricular reforms, such as the CCSS, which require a focus on the habits of thinking because teachers must have the knowledge in order to for the reform to be included into their instruction (Guskey & Yoon, 2009). Further investigation into how teachers use this knowledge when planning for instruction can also provide insight into how professional-development providers can support teachers as they attempt to teach these habits of thinking to their students. By supporting teachers’ development of domain knowledge in their respective disciplines, teachers will be better able to support their students.
Knowledge Teachers Rely on When Planning Lessons for Instruction

The think-aloud and semistructured interviews provided insight into the knowledge that teachers relied on when planning for instruction. The analysis below addresses the second research question, which asked, “Which knowledge domain(s) do high school English/language arts, mathematics, science, and social studies teachers draw upon when planning for instruction, as demonstrated by a think-aloud of lesson construction?”

As mentioned in the summary of survey findings, teachers did report, in some cases, sharing views similar to those of the experts as presented in the expert-novice studies. Although teachers reported having this knowledge, if the curricular reforms that target the improvement of students’ literacy achievement via the implementation of the CCSS and a disciplinary-literacy approach to instruction are to impact student achievement, these practices also need to be apparent in teachers’ planning and instructional activities. If teachers do not provide experiences for their students to engage in the habits of thinking that promote disciplinary literacy, they will not be incorporated into instruction, and this reform aimed at helping adolescent literacy development is likely to be unsuccessful (U.S. Department of Education, 2010). Therefore, careful consideration of teachers’ use of knowledge is necessary to consider possible avenues for professional development that could impact their planning and instruction.

Teachers’ Planning as Impacted by Their Knowledge of and Access to Curricular Guidelines

Because teachers rely heavily on their sources of curriculum when planning for instruction, the habits of thinking need to be made explicit in teachers’ curricular guides,
which can provide teachers with a clear focus to incorporate these goals into their instruction. Across cases, teachers’ planning was shaped by their sources of curriculum and their knowledge of and access to goals, texts, and resources to use in their unit planning. These sources of curriculum were decided at a group level, either through a teacher’s professional learning community or through a district team that worked to identify the content and skills to include in the unit the teacher was planning. In some cases, as with Adam, the English teacher, this clear set of guidelines offered freedom for him to use his knowledge of texts to collaborate with colleagues to create opportunities for his students to engage with varied texts. Conversely, these guidelines limited Claire, the social studies teacher, who reported that she was attempting to include a stronger skills focus in the curriculum but sometimes lost this battle to the teachers who had personal beliefs about the content they thought must be included in the unit. Because the unit was measured by common assessments, all teachers were held accountable to teach what was on the tests, whether or not they agreed with the content.

In all four cases, teachers began to plan with the agreed-upon curriculum, whether it came from a planning guide that listed the standards students should meet or if it came from common assessment and the textbook, as it did in the cases of Christina and Claire. Because a great deal of work occurs on the team level, teams would benefit from professional development that incorporates the habits of thinking and the demands of the CCSS into clearly stated curricular goals.

It was interesting that although these teachers all planned quite differently, they were members of teaching teams, and it was from these teams that they determined the
information of value that would be taught. Although providing a team structure creates curricular alignment among teachers, this alignment can be limiting if the team is not functional or if the team is not aligning their collaborative planning with the CCSS or other required standards.

For example, Claire was frustrated and believed that she could not make the changes she wanted to make in the content and explained that the unit was based on topics listed in the textbook, not on standards that she wanted her students to master. In this case, Clarie’s team impacted her ability to shape the content of her unit, leaving her with a unit she did not believe met her students’ needs or her values. On the other hand, Max and Adam seemed comfortable in their teams and used the clear goals that were aligned with the CCSS and set forth by the teams to guide their thinking. Max and Adam both mentioned several times that they could make changes at the team level, but Claire explained that she would try to make changes but would give in and discard the changes she wanted to make to the curriculum.

It appeared that the four teachers in this study were aligned to what their team required and that this alignment could be beneficial, as in the case of Max and Adam, or difficult to change, as in the case of Claire. Thus professional development aimed at creating successful collaborative teams would be beneficial for teachers as well, so that change can occur when necessary. By targeting the teams, professional-development providers can collaborate with teachers to ensure that teams are functional when using the team structure to facilitate the inclusion of goals that reflect the demands of the habits of thinking embedded in the CCSS or other curricular reform. It is important to note that a
direct connection to the CCSS in curricular teams was not sufficient for Max or Adam to incorporate the habits of thinking into their planning; thus, this curricular development must be completed in tandem with other professional development targeted toward teachers’ knowledge.

**Teachers’ Use of Text and Text Selection as Dependent upon Their Own Knowledge of Resources and Their Sources of Curriculum**

When considering teachers’ planning, one should consider how teachers interact with the texts in the discipline. These interactions can help provide insight into the opportunities the teacher creates for students in the classroom.

At the heart of disciplinary literacy and fundamental to the CCSS are the texts in which students and experts engage (e.g., Moje, 2008). Selecting texts that match the goals of the discipline and teaching students how to engage with those texts in order to gain the value from the text are essential components of successful implementation of the CCSS and a disciplinary-literacy approach to instruction. Geisler (1994) explains that the difference between an expert and a novice is an expert’s ability to create and not just summarize the texts valued in the discipline. Moje (2008) adds that understanding the values in the texts are important to understanding the discipline fully. Texts are an integral component of a discipline.

In the survey, teachers reported that they were fairly confident in selecting texts and providing text sets to students. Nevertheless, they also reported that they were not confident that their students could learn from these texts independently. Thus it is
necessary to consider additional data from the think-aloud to examine this issue more closely. Examining the teachers’ think-alouds provided insight into teachers’ decisions regarding text selection and provided understanding as to why there might be a discrepancy between teachers’ confidence in selecting text and their confidence in their students’ ability to interact successfully with that text.

When Adam, the English teacher, selected texts, he was paying attention to how those texts would help meet the standards and either illustrate an argument or foster thinking on the theme of his unit. He also was concerned with the amount of engagement his students would have with the piece he wanted to include. Adam had criteria based on the standards that were selected for him, and the habits of thinking embedded in those standards, to help him select texts for his students. He focused on the type of text he wanted to include first, and then he focused on selecting which text he would use to ensure that students had access to a variety of texts. Perhaps his reliance on applying criteria to his decision-making fostered his confidence in text selection.

Max, the science teacher was more focused on utilizing nontraditional text in the forms of labs than using traditional texts. He made a distinction between exploratory and confirmatory labs and the benefits and drawbacks of each type of text. Max also spoke of his use of a required textbook that all the teachers of physics used but also of using selected texts such as labs and computer programs to help students master their goals. Max focused his selections on materials that would help him meet the goals set by his curricular team. As did Adam, Max used a predetermined set of criteria, whether or not the texts would help him to reach his instructional goals, to help him select texts for the unit.
Claire, the social studies teacher, relied primarily on providing students with sections of text within the textbook that was assigned to her course. She used the information from the final assessment to help guide her decision-making. Further, when selecting supplemental text, she selected photographs, videos, and speeches that she thought the students would like and also selected texts that moved her when she read them. When considering her supplemental text selection, she did not have a clear connection to curricular goals, although she did ensure that all the texts she chose were on the topic that she was covering within the chapter. As long as the texts were connected to the topic, she was confident in selecting texts for her students.

Christina, the math teacher, also focused her choice of text primarily on the chapter in the textbook that corresponded with the topic of study in the unit. She also found supplemental problems and practice sheets that corresponded with the topic being covered in the unit. Christina considered her students when she was selecting texts. For example, she ensured that her honors students had challenging materials, yet she provided extra practice to her students who struggled. By selecting texts for students by level, Christina provided different experiences for the students in her groups and controlled access to text by level. Although she was likely to be trying to reach her students at their developmental level, she may have been limiting some students’ access to more challenging material.

All four teachers were confident in the texts that they selected to use in the unit. They each considered their goals or topics of studies and their students when selecting texts. This corroborated the data from the survey, in which teachers were confident providing texts and text-sets for their students. Unfortunately, the data did not inquire
about the exact texts teachers selected or the purposes for the texts. Future research should inquire to which texts teachers use and if their confidence wavers when selecting from a variety of different texts. Additionally, because teachers all applied criteria to their decision-making regarding text, a focus would be beneficial on collaborating with preservice teachers and inservice teachers to develop criteria for text selection that aligns with the texts valued in the discipline.

**Teachers’ Choice of Text as Influenced by Their Own Interactions with Texts**

As discussed earlier in the chapter, the survey results indicated that many of the teachers report interacting with the texts in the discipline via habits of thinking that may be similar to those of experts. For example, the social studies teachers reported considering point of view and context when reading text, and the math teachers reported relying on symbols and equations as text.

Interestingly, when looking at the interview data, teachers reported reading materials related to their teaching and not necessarily related to their own learning in the discipline. For example, Claire, the social studies teacher, stated that she regularly read her textbooks, the newspaper, and some magazines. She also reported learning from nonfiction texts such as Zinn’s *A People’s History* (Zinn, 2005). Max, the science teacher, reported reading professional journals, both in his field of physics and in the educational field.

Christina, the math teacher, reported reading texts related to her teaching, such as textbooks, but not reading many texts from the field of mathematics. Adam, the English
teacher, reported reading the texts he assigned to his students and personally enjoyed reading educational texts and audio books.

Teachers in this study relied on a variety of texts to guide their instruction. These texts helped to shape the experiences the teachers were providing for their students. It would be interesting to consider how their teaching might be impacted by professional development that provided opportunities to consume and learn from texts in their disciplines. Once given an opportunity to engage in the habits of thinking with the texts in the disciplines, teachers might be able to provide similar experiences for their students.

Another common theme across cases was that the teachers did not see themselves as consumers of text in the discipline; instead, they considered themselves as teachers and used their teacher lens when considering texts. It was difficult for the teachers to take off their “teacher hats,” although they were prompted to do so multiple times during this section of the interview. For example, when asked how he interacted with texts of his discipline, specifically whether he viewed text as argument, Max, the science teacher, connected his reading back to his classroom in that he explained that there were no frontiers in physics that students could read from textbooks, so he did not view texts as arguments.

Claire, the social studies teacher, also had a difficult time separating herself from her role as teacher when considering her use of text. During her interview, she focused on her own thinking of text to connect to her expectations for her students’ interactions with texts. Adam, the English teacher, also thought of his own interactions with text in terms of how his students would relate to and react to the texts. Christina, the math teacher, described the process one must go through in order to be successful with the texts of the
discipline. But none of these experiences were clearly articulated, and Christina and Claire both expressed concern at being able to translate these experiences for their students. Perhaps teachers need more awareness of their own processes so that they will be comfortable teaching these processes to their students. Professional development that would provide space and time for this type of thinking would likely benefit both teachers and students.

For example, allowing Claire to engage with a text set of a variety of texts from which she could learn about a historical topic and about which she could write an argument would allow her to learn her own process of interacting with text that she could then model it for her students. Or if Max had the opportunity to engage with conflicting scientific arguments he could investigate, he might view texts as arguments and then be able to foster that type of thinking in his students. This focused professional development would ensure that teachers had the opportunities to engage in the habits of thinking in which the experts of their respective disciplines engage. Perhaps these experiences would provide teachers with the confidence and experiences necessary to share these experiences with students.

Teachers’ Instructional Goals as Based on Their Identified Assessments

Teachers’ decisions for what ultimately made it into their units of instruction were based on the content of the assessments and their familiarity with the goals of the assessments. For example, Adam explained that he no longer taught texts simply because he liked the texts. He explained that because he knew his students had to demonstrate
mastery on four standards at the end of the unit, he could select only texts that would help students reach those goals.

When considering his unit plan, Max also considered students’ assessment when determining how best to provide instruction. Max believed that he had to provide multiple avenues and multiple texts to reach the goals to best meet the needs of his students. That meant that he would include labs, text reading, video, and simulations centered on his instructional goals.

Claire, who focused more on the textbook as a source for planning, had an idea of what she wanted her students to accomplish but had difficulty articulating a specific goal as she was focused on making sure her students had the information necessary to pass the content-heavy assessment. Christina was also able to talk topically about her goals but also had difficulty articulating exactly what she was expecting other than the problems that she knew were going to be on the test. That is, she would ensure that her students had the opportunity to practice the skills that would be measured by the assessment.

Predetermined assessments, that teachers may or may not have created or agree with, played a powerful role in each teacher’s planning process. Even though Claire stated that she was not entirely pleased with the assessment her curricular team decided to use, she still focused her instruction on this assessment. Thus, if professional-development providers want to impact teachers’ planning, they should also focus on how assessments are constructed and the content of these assessments, as they are influential in teachers’ decision-making processes. Further, because assessment decisions were all made at the team level, it appears that teams of teachers or districts might benefit from professional
development on creating instructional outcomes that would then shape teachers’ assessments and, consequently, instructional practices.

**Teachers Reliance on Complex Skills When Designing Units for Instruction**

An inquiry into the knowledge on which teachers rely when planning for instruction provides a great deal of insight into the process of planning for instruction. Equally important is the consideration of which skills the teachers rely on when planning for instruction. That is, what are they doing when they are planning and how are they tapping into their knowledge? Regardless of a teacher’s discipline, source of curriculum, or any other factors, all teachers in the study relied on the following skills, to varying degrees:

- Considering students’ knowledge and/or misconceptions,
- Referencing materials/sources of curriculum (including assessment),
- Reflection leading to the affirmation or rejection of an idea,
- Considering content from a previous lesson or unit,
- Selecting instructional or literacy strategies,
- Addressing a habit of thinking, and
- Considering the sequence of instruction.

These skills on which teachers rely in order to plan for instruction are complex. In addition to engaging in these behaviors, teachers must consider their knowledge of curriculum, texts, and assessment. If teachers are to incorporate new knowledge effectively into this already-complex structure, targeted professional development is necessary.
Professional-development providers could consider the model of teachers’ application of knowledge to the planning process and use the framework for professional development to support teachers as they work to enact curricular reform, specifically, the habits of thinking embedded into the disciplinary-literacy approach to instruction and reflected in the CCSS as curricular reform.

The four focal teachers in the study were all passionate and experienced educators who expressed that they enjoyed working with their students and believed they were responsible for their students’ learning. If given access to the type of texts and thinking required by the disciplines, these teachers would readily incorporate a discipline-specific and CCSS-aligned approach to literacy instruction into their instruction.

Although the teachers did reference the habits of thinking in their think-aloud, there was little explanation of how that thinking would be translated into practice. Teachers in the survey also reported varying degrees of confidence in their students’ abilities to engage in these habits of thinking. Regardless of a teachers’ level of reported confidence, the habits of thinking were not mentioned often in teachers’ planning, so it was unlikely that teachers were transferring this knowledge to students in the classroom.

For example, Adam, the English teacher, mentioned the habits of thinking six times throughout the think-aloud. He wanted his students to focus on how authors craft prose. It was important to him that his students would be able to comment on the form as well as content (Wilson, 2011). He also thought about fostering thinking about multiple viewpoints on the topic. Adam knew he wanted his students to engage in this type of thinking, but he did not have a clearly defined plan for how this might occur. He did not have a strategy or
set of strategies that might foster the development of the type of thinking in which he wanted his students to engage. Perhaps if he had time to reflect on his own process, he would be able to collaborate with a literacy coach or instructional coach in order to create a heuristic on which his students could rely as a scaffold to this type of learning. Without going into the classroom, which was a limitation of this study, there was no way to know if Adam’s aspirations translated into practice for students and if the students were able to complete the discipline-specific literacy tasks successfully. Future research into teachers’ in-class disciplinary-literacy practices would be of benefit to the field.

Max, the science teacher, also mentioned some of the habits of thinking but, like Adam, did not have a plan for how he would encourage his students to engage in this type of thinking. Although it was important to him that his students would be able to hypothesize and explain why they thought their observations occurred, he also did not explain how he would go about fostering this type of thinking for his students.

To be clear, teaching and planning for instruction is complex and unnatural (Ball & Forzani, 2011). Thus, preservice teacher educators and professional-development providers must adapt their practices to the current context and provide teachers with the education necessary so that they can enact curricular reform.

Implications

The findings presented in this chapter build an argument that although teachers report possessing varying degrees of disciplinary-literacy knowledge, this knowledge has not yet been integrated into instruction. This integration requires professional development
for inservice teachers and a focus on integration during preservice teacher preparation programs. This can be accomplished through the consideration of teachers’ application of knowledge to the planning-process model.

Across cases, teachers applied their knowledge to planning similarly. That is, teachers applied the knowledge they gained from their own experiences with the values of the discipline to planning. They also applied their knowledge of curricular resources, their understandings from their work with their curricular teams, their knowledge of assessments and instructional outcomes, and their knowledge of students’ needs to their planning process (see Figure 7). This model is important because in order to connect to student achievement, professional development should begin by enhancing teachers’ knowledge and skills (Yoon et al., 2007).

Figure 7. A model of teachers’ application of knowledge to the planning process.
In the outer circle of this model of teachers’ application of knowledge to the planning process are the opportunities a teacher has had to engage in the habits of thinking in the discipline. This is the foundation of the model because it is a teacher’s tacit knowledge in the domain (Alexander & Judy, 1988) that allows him or her to participate in the Discourse community (Gee, 2005) to which he or she belongs. If a teacher has an opportunity to engage in the habits of thinking in which those in the Discourse community engage, he or she may also then belong to that Discourse community, which impacts the decisions a teacher makes when planning for instruction. If one belongs to the Discourse community of biologists, the tacit knowledge and values that members of this Discourse community possess would shape one’s values and thus the core of one’s decision-making. If a teacher’s experiences and opportunities to engage in the thinking of the discipline were more aligned with the habits of thinking of secondary biology teachers, his or her values and experience in that Discourse community would shape his or her curricular decisions. Thus, fostering teachers’ knowledge and experiences with Disciplinary literacy knowledge or whatever the content of the educational reform should be the first priority for a professional-development provider.

In the inner circle of the model is a teacher’s knowledge of students’ needs. This is the next area of focus for professional-development providers because if a teacher believes that his or her students are not able to engage in an activity or master a skill, he or she is less likely to provide that experience for students. By focusing on students’ needs, teachers and professional-development providers can build bridges that lead students to engage in the habits of thinking in the discipline. Thus, professional-development providers can
foster understanding of students’ abilities and provide teachers with scaffolds to support students as they collaborate to include aspects of reform into instruction.

Nested inside the circles representing a teacher’s knowledge of his or her students’ needs and a teacher’s experiences engaging in the habits of thinking of his or her discipline are three sources of knowledge that teachers apply to their planning process. These sources of knowledge interact and contribute to the decisions teachers make when planning. A teacher considers assessments, the decisions made in curricular teams, and his or her sources of curriculum when engaging in the planning process. Because teachers rely on knowledge in these areas when planning units for instruction, professional-development providers can focus on including the demands of educational reforms in these areas so that teachers can include these reforms in their planning process. For example, in the case of disciplinary literacy reform, professional-development providers can help teams create instructional outcomes that include a focus on both process and skills and include these in curricular architecture that teachers can use to plan for instruction. In addition, professional-development providers can collaborate with teachers’ professional-learning communities to select texts and assessments that allow students to engage in the habits of thinking in the discipline. Teachers can then rely on these assessments and sources of curriculum when planning units for instruction. By considering each aspect of the application of teachers’ knowledge to the planning process, professional-development providers can ensure that they are helping to prepare teachers to enact disciplinary literacy instruction and other curricular reforms.
Each of the four focal teachers in this study relied on the knowledge reflected in this model when planning lessons for instruction. Furthermore, these teachers relied on a complex set of skills in order to plan units for instruction; however, these skills do not require the teachers to engage in the habits of thinking in their respective disciplines. Rather, these teachers appeared to rely on habits of thinking of educators that include more general aspects of pedagogy and not a discipline-specific approach. Thus, in order to implement the CCSS and a disciplinary-literacy approach to instruction, teachers need individual professional development in the habits of thinking required by the discipline, team professional development to create clear instructional outcomes and cohesive, productive teams, and professional development that builds on the skills on which teachers already rely to plan for instruction to include discipline-specific thinking.

Including curricular reform into the already-complex process of teaching requires a multisystem approach to professional development. While Ball and Forzani (2011) describe a systematic approach to reforming preservice teacher education through targeted instruction in high-yield strategies, a systematic process of professional development is necessary if teachers are to enact any educational reform, especially the educational reform that includes disciplinary literacy. This is necessary primarily because although teachers report engaging in some of the habits of thinking when interacting with texts, there is little evidence to suggest that teachers are relying on these skills when planning for instruction. That is, the four focal teachers did not include much attention to the habits of thinking in their respective disciplines as they planned for instruction. Therefore, a framework for a
multisystems approach to professional development is necessary in order to enact complex reform.

Considering aspects of teachers’ application of knowledge to the planning process allows professional-development providers to analyze a teacher’s or a district’s needs. Then the multisystems framework for professional development could foster teachers’ ability to include any adaptations to curriculum to ensure the goals of educational reform; in this case, the implementation of the CCSS would be met. Although the framework could apply to any curricular reform, the examples provided here rely on teachers’ inclusion of disciplinary-literacy instruction into their planning, as this was the focus of this study.

The multisystems framework to professional development allows teachers the opportunity to engage in curricular reform. This approach impacts each component of the teachers’ application of knowledge to their planning-process model and requires systematic collaboration among many groups of stakeholders. Figure 8 shows an outline of this framework.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preservice teacher educators</td>
<td>Consider collaborations between education professors and professors in the various disciplines to provide preservice teachers with an opportunity to engage in the literacies of the discipline when enrolled in teacher or preparation programs. These collaborations could also produce graduate-level courses for inservice teachers.</td>
</tr>
<tr>
<td>District administrators</td>
<td>Provide teachers with clear goals for courses and clear goals for professional learning team functionality.</td>
</tr>
<tr>
<td>Professional-development providers</td>
<td>Consider the model of teachers’ application of knowledge to the planning process when determining areas of need with individual teachers and teams of teachers.</td>
</tr>
<tr>
<td></td>
<td>Provide tailored professional-development opportunities for any component of the teachers’ application of knowledge to planning model a teacher requires.</td>
</tr>
</tbody>
</table>
Serve as a liaison among all systems by engaging in activities, such as creating opportunities for teachers to engage in the type of thinking that the curricular reform requires via collaborations with university professors in the academic disciplines; collaborating with administration to consider necessary curriculum and use this to collaborate with teachers to create criteria for text selection; and collaborate with teachers to unpack and consider students’ needs, conceptions, and misconceptions in the discipline.

<table>
<thead>
<tr>
<th>Teachers</th>
<th>Engage in the texts of the discipline similar to the manner in which the experts engage with texts in the disciplines. Work with professional-development providers to clarify the necessary habits of thinking to allow students the opportunity to apprentice to the discipline.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focus on professional goals that target identified knowledge in the teachers’ application of knowledge to planning model.</td>
</tr>
</tbody>
</table>

**Figure 8.** Multisystem framework for professional development.

The first level of the framework provides training to preservice teachers, as well as inservice teachers, via courses that focus on providing the opportunity for learners to engage in the habits of thinking in which experts engage so that they can later transfer these practices to students. Ideally, a chemistry professor (statistics professor, American literature professor, and so on) would collaborate with a teacher educator to create experiences for students that allow them to engage in discipline-specific literacy practices. These tacit practices would be made transparent for preservice teachers, who would also consider how they could transfer this knowledge to students. Teachers of all disciplines would be afforded the opportunity to engage in this type of thinking. These courses could be offered to preservice teachers but could also be adapted to be included as graduate courses for inservice teachers. A focus on language use and text would be helpful for teachers; when they have learned how language functions in the discipline, they are ready to interact with the texts of the discipline (Fang, 2012b).
The model for preservice teacher education being piloted with preservice U.S. history teachers at the University of Michigan (Bain, 2012) could serve as a model for how to provide these experiences to preservice teachers as students spend three semesters engaging in thinking as a U.S. historian thinks and engaging in the practices valued in the discipline. An expansion of this model to all disciplines and graduate-level courses for inservice teachers would be beneficial to ensure that teachers had the opportunities necessary to provide students with discipline-specific literacy instruction.

Additionally, preservice teacher educators could use the application of teachers’ knowledge to a planning model when considering course curriculum in secondary preservice education courses. If preservice teacher educators unlock the tacit knowledge held by the Discourse community of secondary teachers for these preservice teachers, they may be better able to organize their thinking about complex teaching tasks. Further, preservice teacher educators could provide resources and instruction in the elements of the model. For example, courses could include instruction in the process of planning by modeling each element of the model. Preservice teacher educators can explain that teachers plan units by examining their curricular goals, working effectively within a team, creating specific criteria to apply to text selection, and creating effective assessments based on clear instructional outcomes. Curriculum designed to foster successful experiences in each of these elements would be beneficial for students as well.

The second level of the framework considers the role of a school or district’s administrative team. Because the teachers relied so heavily on their sources of curriculum, administrative teams could ensure that the goals stated in curricular guidelines state clearly
the inclusion of the educational reform, in this case, disciplinary-literacy practices. Further, because so much of the knowledge upon which teachers rely when planning for instruction comes from their work with their curricular teams, it is imperative that these teams are functional and also aligned with the goals of the curricular reform. Clearly stated goals for team participation that are aligned with the goals of reform can facilitate collaborative efforts.

The third level of this framework involves utilizing a professional-development provider who considers components of teachers’ application of knowledge to the planning-process model in his or her work with individual teachers or groups of teachers. For example, if a teacher has not had experiences engaging with the texts of the discipline, the professional-development provider would work to provide those experiences for the teacher so that the teacher can incorporate that instruction into his or her planning and ultimately instruction. The professional-development provider should collaborate with teachers in any area of need in the application of knowledge to a planning model. Further, the professional-development provider can serve as a liaison to facilitate professional development among all systems.

The final level in this framework involves the work of the teacher. Teachers, or teams of teachers, should engage in professional development in each area of the teachers’ application of knowledge to a planning model. That is, when collaborating with professional-development providers, they should set goals for their own professional growth that targets their own opportunities to engage with text as the experts in the field do, if that is an area in which the teacher believes he or she can or needs to grow. Also, the
teachers can collaborate with professional-development providers to develop sources of curriculum, foster productive collaborative teams, develop assessments that measure instructional outcomes that match their goals, or consider student needs. Also, teachers can collaborate with professional-development providers to consider their own criteria for text selection to examine whether or not the selected texts help them meet their curricular goals.

Students are being asked to perform at higher levels than ever before. In order to rise to that challenge and help students perform, professional development also needs to adapt (Au, 2013). The professional-development framework outlined above might serve as one such adaptation because it connects to the process that teachers already use when applying knowledge to their planning as a guide. By focusing on how each system can impact teachers’ planning process, teachers can have the resources and knowledge necessary to enact these complex reforms.

High school teachers in this study shared habits of thinking in how to plan for instruction, as reflected in the teachers’ application of knowledge to their planning-process models, but they did not necessarily share in the habits of thinking in which the experts in their respective fields engage. This is problematic if teachers are to apprentice students to this type of thinking.

In order to incorporate this discipline-specific approach into instruction successfully, high school teachers need time to consider the habits of thinking in the disciplines. For example, high school English/language arts teachers need an opportunity to study a difficult poem or novel and determine how their own thinking helps them unlock meaning in the text. These teachers also need the opportunity to write discipline-specific
arguments in order to consider how to do this effectively so that they can model this practice for students. High school math teachers need to be able to articulate how they reason through a problem and how to structure arguments to prove their thinking logically so that they can model this for students. Science teachers require time to determine how they best interact with the texts in their disciplines and how to structure a scientific argument. Finally, social studies teachers require time to think about what it means to write an argument in history and how to reason historically. They also need time to consider how best to interact with challenging texts in their discipline, such as political cartoons, so that they can create successful experiences with these texts for their students. In fact, after their study on incorporating disciplinary-literacy instruction into middle schools, Monte-Santo et al. (2014) posit that the disciplinary-literacy research agenda should focus on developing teachers’ knowledge as much as it should emphasize teachers’ learning.

All teachers require professional development to ensure that the teams of teachers with whom they collaborate are effective and not limiting. Not only do these teams require professional development to ensure that they align with curricular reform, but they also need to learn how to create clear instructional goals that serve as the guide for future planning and curricular development. Also, preservice teacher educators from all disciplines require experience engaging in the habits of thinking in the disciplines.

Au (2013) calls for a more focused plan for professional development in light of the increasing complexities of education and demands as teachers are being asked to increase student achievement to higher levels than before. The multisystems framework for
professional development could ensure that all teachers have the opportunity to engage in this professional development that is essential to fostering curricular reform.

Furthermore, preservice teacher education programs also need to adapt in order to prepare teachers effectively to help their students meet these increasing demands. By receiving opportunities to engage in the habits of thinking, preservice teachers will be better prepared to offer these same opportunities to their students. Also, teacher educators can unlock the tacit knowledge held by secondary teachers by instructing students in the application of knowledge to the planning process model. These preservice teachers can learn what and how to apply knowledge to planning and work to develop their knowledge in each element of the model. Without experiences focused on participating in the behaviors in which experts engage, it is likely that the teachers will remain in the Discourse community of secondary school teachers rather than enter the Discourse communities of their respective disciplines. Without access to the tacit knowledge with which those in the Discourse communities are privileged, it is unlikely that the teachers will be able to teach students the norms and conventions of the discipline.

Limitations

Several limitations must be considered when interpreting the results of this study. First, one limitation of the think-aloud is that it represents only verbalized cognition and not anything that the teachers do not report. Additionally, the think-aloud may slow teachers’ thought processes and not completely represent a teacher’s planning process (Ericsson & Simon, 1980). In an attempt to mediate this limitation, probes were used with teachers if
they did not include four common elements of unit construction. These probes were
designed to prompt teachers’ thinking about text selection, lesson objectives, assessment,
and instructional delivery. Also, teachers were interviewed after the think-aloud and were
given the opportunity to explain or alter their unit plan. Finally, teachers were asked to
review transcripts and determine whether or not the transcripts represented their planning
process accurately.

The survey data also present a limitation in that they include only self-reported
knowledge, and there is no connection to what the teachers are actually doing when
teaching and interacting with the texts in their discipline. The think-aloud protocol and
semistructured interview data attempted to augment the limitations of survey responses
with regard to the knowledge teachers possess that is present in instructional planning, and
the semistructured interview questions attempted to corroborate items in the survey by
allowing the four teachers to report and expand on what they were doing when interacting
with texts in their disciplines. Nevertheless, teachers’ own practices with the texts of their
disciplines were not observed.

Finally, the sample size for the survey was robust and adequately represented the
population of teachers from the northern Illinois region, but the sample size for the think-
aloud protocols and the semistructured interviews was limited to four participants, and this
sample size is limiting. Future research could investigate teachers’ knowledge using a
broader sample.
Future Research

Although this study serves as an important entry into an investigation into high school teachers’ disciplinary-literacy knowledge, there is much to be discovered, and future research could help build an understanding of teachers’ knowledge and the ways in which they use this knowledge.

First, although high school teachers reported their thinking on a survey for this study, there is no proof that teachers actually engage in the thinking that they reported to engage in. Therefore, it would be interesting to conduct more expert-novice studies, with doctoral candidates or those who hold terminal degrees in various disciplines serving as the experts and high school teachers from those same disciplines serving as the novices. By comparing the thinking in which the experts engage to the thinking in which the teachers engage, one could determine what, if any discrepancies exist. In this study, identified experts could engage in reading a series of texts valued in their respective disciplines. High school teachers could also read the same texts. Just as in the previous expert-novice studies, behaviors in which each group engaged could be compared. This could provide insight into whether or not high school teachers’ thinking does or does not align with the habits of thinking in which the experts engage. To also investigate teachers’ writing practices, high school teachers and identified experts could engage in a writing task. Their approaches to the writing task, content of the writing, and the reasoning used could be compared to determine whether or not the experts’ and high school teachers’ writing practices are also aligned.
Another avenue for future research could include a comparison of teachers’ education and the relationship to their inclusion of disciplinary-literacy practices. That is, teachers in this survey reported whether or not they held advanced degrees but were not asked to report the discipline of the degree. A research question to address this gap might be, “How does disciplinary-literacy knowledge vary for teachers who hold master’s degrees in the discipline as compared to teachers who hold master’s degrees in other fields?” Comparing teachers’ ability to combine disciplinary-literacy practices and their advanced degrees may provide insight into how much education is required for teachers to include disciplinary-literacy instruction successfully in their courses.

Finally, several recommendations were made regarding professional development for teachers, especially in the application of the multisystem framework for professional development. Studies need to be conducted to test whether or not these approaches to professional development have a positive impact on teacher practice and student achievement. That is, when a school or district applies elements of the framework to their professional development, do teachers enact that reform? And do students benefit?

Final Thoughts

This investigation into high school teachers’ disciplinary-literacy knowledge revealed that high school teachers do report to engage in some of the same habits of thinking in which experts engage. Still, they do not report to engage in all of the habits of thinking in which experts engage. Although teachers report to possess disciplinary-literacy knowledge in varying degrees, this knowledge was not yet integrated into their planning.
Implications regarding the use of the application of teachers’ knowledge to the planning-process model and multisystem framework for professional development were discussed as avenues for preservice teacher educators and professional-development providers to provide support for teachers as they work to include discipline-specific literacy instruction into their courses. Avenues for future research studies were also explored.

Disciplinary-literacy instruction holds promise as an avenue to impact adolescent students’ literacy performance. This approach can allow students to apprentice to a discipline in a manner that may unlock understanding in such a way that it might create passion for a subject. It also requires teachers to focus on the language used in texts, the texts themselves, and authorship when presenting texts from their discipline to students. This can teach students of varying ability levels how to interact with and make meaning from texts. This approach to instruction fosters literacy growth for all students.

In an attempt to unlock tacit knowledge regarding the literacies specific to each discipline, research was conducted to examine the ways in which experts in the field engaged with text. These practices were then provided in the form of curriculum and heuristics to teachers so that teachers could use these to help students apprentice to the discipline. Unfortunately, high school teachers’ disciplinary-literacy knowledge was not measured. Although professional development has been provided for teachers, the focus of this professional development has been on teaching teachers how to teach for disciplinary literacy, not how to engage in disciplinary-literacy practices.

The knowledge teachers possess is too important to overlook in this era of ever-increasing accountability merged with expansive curricular reform. If teachers are to be
held responsible for teaching students to be apprentices, these teachers need the opportunity to serve as apprentices as well. The results of the survey were mixed. It is still unclear how teachers interacted with the texts of their disciplines. Nevertheless, the habits of thinking were not incorporated into teachers’ instruction, so even if the teachers had the knowledge, they needed access to professional development that would offer them the confidence necessary to incorporate this type of thinking into their instruction.

This professional development cannot be placed solely on the backs of the teachers. Each stakeholder in the system bears responsibility to enact curricular reform, from the preservice teacher educators to the school or district administration to the teachers themselves. For example, if a teacher is beholden to the decisions made by her curricular team, and this curricular team is dysfunctional, it should be the role of the administration to step in and intervene so that the teacher is not prevented from enacting reform. All stakeholders have a duty to enact reform so that the students will benefit.

Further, proper funding for this professional development should always be considered as part of the cost of any educational reform. Without assurances that teachers will have opportunity to engage in the thinking required by a discipline-specific approach to literacy instruction, there is no guarantee that this promising instructional approach will work.

When selecting this topic of study, the researcher feared that the results of this study might be fodder for further critiques of teachers’ professionalism. Therefore, she would be remiss if she did not point out the following: 311 teachers spent their valuable time completing a survey for no other reason than to learn from the results of the survey; no
incentives were provided for their time. Four teachers spent between two and three hours thinking aloud and making themselves vulnerable for a small honorarium but mostly for the benefit their work might add to the field. Clearly, teachers are not unwilling to work to grow professionally or to enact reform, especially if that reform is directly connected to their students. During the think-alouds and interviews, Claire, Adam, Max, and Christina expressed a passion for education and for their students. They worked to create experiences they thought would be beneficial for their students. And not once did the teachers blame their students for being unable to meet their goals; instead, they worked to determine how they could adapt their planning and their instruction to help their students better meet their goals.

Perhaps it is also time for each level of stakeholder in the multisystems approach to professional development to continue to examine practice and consider how best to support teachers so that they can reach their goals. This study is a small, initial step meant to investigate teachers’ current knowledge so that opportunities and experiences can be offered to teachers to engage in the activities in which the experts engage. It is important to remember that expertise is not developed by hard work alone or by merely practicing the same skills over and over (Ericcson & Charness, 1993); rather, expertise is developed by engaging in the activities in which the experts engage (Geisler, 1994). Preservice teacher educators and professional-development providers can provide teachers with these opportunities.
REFERENCES


Hicks, T., & Steffel, S. (2012). Learning with text in English language arts. In T. L. Jetton & C. Shanahan (Eds.), *Adolescent literacy in the academic disciplines: General principles and practical strategies* (pp. 120-154). New York: Guilford Press.


APPENDICES
APPENDIX A

EMAIL TO SURVEY PARTICIPANTS INFORMING THEM
OF STUDY AND CONSENT PROCEDURES
Email Script for Survey Participants Informing Them of Study and Consent Procedures

Hello,

If you teach math, science, social studies, or English, please consider clicking on this link https://www.surveymonkey.com/s/dis_lit to complete a survey on high school teachers’ disciplinary-literacy knowledge. This survey data is being collected by Paula Di Domenico, who is currently a literacy coach at the Leyden High Schools (District 212) and is working on her dissertation to complete her program at Northern Illinois University.

She is investigating high school teachers’ discipline-specific literacy knowledge to consider what professional-development opportunities should be made available for teachers as they work to implement the Common Core State Standards. The survey will take approximately 10-15 minutes to complete and no identifying information will be collected.

If you have any questions or would like to view results from the study, please contact Paula at [e-mail address] or [phone number].

Link: https://www.surveymonkey.com/s/dis_lit

Thank you.

Informed Consent Found on Survey Introduction on SurveyMonkey:

You have been invited to participate in a study about high school teachers’ knowledge of discipline-specific literacies. This will help inform teacher educators and professional-development providers as they work to help teachers implement discipline-specific literacy instruction and help them meet the demands of the Common Core State Standards. Participation in this study involves completing the online survey, which will take about 15 minutes. Participation is voluntary and no identifying information will be collected. By completing the survey, you are giving your consent for your responses to be included in this study.

A summary of the results will be available when data collection and analysis have been completed. To obtain a copy, email the researcher at [e-mail address] or call her at [phone number]. If you would like more information regarding your rights as a research participant, you may contact the Office of Research Compliance at Northern Illinois University at 815-753-8588.
APPENDIX B

THINK-ALOUD INTRODUCTION SCRIPT AND CONSENT FORM
Think-Aloud Introduction Script and Consent Form

Hello,

I am working on my dissertation for a doctorate in curriculum and instruction, with a focus on literacy education. I am investigating the knowledge high school teachers have regarding the literacies specific to their disciplines and the knowledge they rely on when planning for instruction.

The results of this study will help me determine the disciplinary-literacy knowledge that teachers use when planning for instruction. This can help inform teacher educators, as well as professional-development providers, as they work to prepare teachers to implement the Common Core State Standards and the discipline-specific literacies required by these standards. I would like to invite you to participate in this study by completing a think-aloud protocol when planning a unit for instruction. After the think-aloud protocol is complete, I will invite you to participate in a semistructured interview. The entire process will take no more than two and a half hours. I realize this is a substantial amount of time, so I would like to offer you $50 as compensation for your time.

There are no foreseeable risks to participation in this study. If you agree to participate in this study, please sign the enclosed consent form. If you have questions, please contact me at [phone number] or at [e-mail address]. You may also contact my advisor, Laurie Elish-Piper at [e-mail address] or 815-753-8556. In addition, if you desire more information regarding your rights as a research participant, you may contact the Office of Research Compliance at Northern Illinois University at 815-753-8588.

Sincerely,

Paula Di Domenico
Research Study Consent Form (Note: This is here only for your review. I will bring an official copy to the interview for you to sign if you decide to participate.)

High School Teachers Disciplinary-Literacy Knowledge: A Mixed-Method Study

I agree to participate in the research project titled High School Teachers’ Disciplinary-Literacy Knowledge being conducted by Paula Di Domenico, a graduate student at Northern Illinois University. I have been informed that the purpose of the study is to determine the knowledge that high school teachers have regarding discipline-specific literacies and the knowledge they rely on when planning a unit for instruction.

I give my consent to participate in the research study, High School Teachers’ Disciplinary-Literacy Knowledge: A Mixed Method Study.

I understand that:
- My participation is completely voluntary, which means that I can choose to stop participation at any time without penalty.
- I will be asked to think aloud as I plan a unit for instruction.
- I will be video-recorded during the think-aloud protocol, which will take no more than two hours.
- Digital images of the materials I use when planning for instruction will be captured using a digital scanning application.
- I will be audio-recorded during the semistructured interview, which will take approximately 15-20 minutes.
- My name will not appear on the audio recordings, video recordings, notes, or digital images so that my identity will be kept confidential.
- The consent form will be kept separate from the data, and the data will be stored in a secure location.
- I will be given an opportunity to review the transcripts from the video and audio recordings and offer revisions prior to data analysis.
I have read the information about this study, and I give my consent to participate in this research study.

___________________________________  _______________________
Signature  Date

I agree to be audio-recorded during the interview.

___________________________________  _______________________
Signature  Date

I agree to be video-recorded as I participate in the think-aloud protocol when planning a unit for instruction.

___________________________________  _______________________
Signature  Date

I agree to allow the researcher to capture digital images of the materials I use when planning for instruction.

___________________________________  _______________________
Signature  Date
APPENDIX C

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL
July 3, 2013

MEMORANDUM

TO: Paula Di Domenico
Department of Literacy Education
5301 Center Ave.
Lisle, IL 60532

FR: Christopher P. Parker, Vice Chair
Institutional Review Board #1

RE: Graduate student research involving the use of human subjects for the project titled High school teachers’ disciplinary literacy knowledge: A mixed-method study

This is to inform you that the above-named application for human subjects research has been approved by Subcommittee Review. The rationale for expedited review is section 45 CFR 46.110 and 21 CFR 56.110. Categories 6 & 7. Although you may begin data collection immediately, please be advised that federal regulations require that the Institutional Review Board (IRB) be made aware of all research activities that place human subjects at maximum or minimum risk. Your application will be brought to the attention of the IRB at its next meeting. This approval is effective for one year from the date of this letter.

Unless you have been approved for a waiver of the written signature of informed consent, I have enclosed a date-stamped copy of the approved consent form for your use. NIU policy requires that informed consent documents given to subjects participating in non-exempt research bear the approval stamp of the NIU IRB. This stamped document is the only consent form that may be photocopied for distribution to study participants. If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance for assistance. Continuing review of the project, conducted at least annually, will be necessary until you no longer retain any identifiers that could link the subjects to the data collected.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that this project has current IRB approval at all times, and for retaining the signed consent forms obtained from your subjects for a minimum of three years after the study is concluded. If consent for the study is being given by proxy (guardian, etc.), it is your responsibility to document the authority of that person to consent for the subject. Also, the committee recommends that you include an acknowledgment by the subject, or the subject’s representative, that he or she has received a copy of the consent form. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems or risks to subjects and others. Please accept my best wishes for success in your research endeavors.

CPP: psw
cc: E. Shin
   L. Elish-Piper
   Graduate School
   Institutional Review Board members
   ORC #HS13-0225

Northern Illinois University is an Equal Opportunity/Affirmative Action Institution.
Research Study Consent Form

"High School Teachers Disciplinary Literacy Knowledge: A Mixed Method Study"

I agree to participate in the research project titled High School Teachers' Disciplinary Literacy Knowledge being conducted by Paula Di Domenico, a graduate student at Northern Illinois University. I have been informed that the purpose of the study is to determine the knowledge high school teachers have regarding discipline-specific literacies and the knowledge they rely on when planning a unit for instruction.

I give my consent to participate in the research study, "High School Teachers' Disciplinary Literacy Knowledge: A Mixed Method Study."

I understand that:

- My participation is completely voluntary, which means that I can choose to stop participation at any time without penalty.
- I will be asked to think aloud while I plan a unit for instruction.
- I will be video-recorded during the think-aloud protocol, which will take no more than two hours.
- Digital images of the materials I use while planning for instruction will be captured using a digital scanning application.
- I will be audio-recorded during the semi-structured interview, which will take approximately 15-20 minutes.
- My name will not appear on the audio recordings, video recordings, notes, or digital images so that my identity will be kept confidential.
- The consent form will be kept separate from the data, and the data will be stored in a secure location.
- I will be given an opportunity to review the transcripts from the video and audio recordings and offer revisions prior to data analysis.

I have read the information about this study, and I give my consent to participate in this research study.

Signature ___________________________ Date _________________

APPROVED

JUL 03 2013

BY N.U.L.R.B.
VOID ONE YEAR
FROM ABOVE DATE
I agree to be audio-recorded during the interview.

Signature ____________________ Date __________

I agree to be video-recorded as I participate in the think-aloud protocol while planning a unit for instruction.

Signature ____________________ Date __________

I agree to allow the researcher to capture digital images of the materials I use while planning for instruction.

Signature ____________________ Date __________
APPENDIX D

ONLINE SURVEY MEASURING TEACHERS’ DISCIPLINARY-LITERACY KNOWLEDGE
Online Survey Measuring Teachers’ Disciplinary-Literacy Knowledge

**Construct**  | **Items** | **Type**
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Teachers’ View of Text/Author | Directions: As you answer the following questions:  
- think about how you use text to learn in your discipline (science, math, social studies, or English/language arts).  
- when you think of the term text, consider a broad definition. That is, text is anything that brings a message to someone. For example, text could be a movie, an illustration, an equation, a formula, a poem, a song, an article, or a lecture.  
[Very Likely, Likely, Undecided, Unlikely, Very Unlikely] | Likert

1. When you are interacting with texts in your discipline, how likely are you to consider the author to determine whether or not the source is credible?
2. When you are interacting with texts in your discipline, how likely are you to consider the events taking place around the time the text was written?
3. When you are interacting with texts in your discipline, how likely are you to read more than one text when reading to learn about a topic?
4. When you are interacting with texts in your discipline, how likely are you to read more than one type of text (videos, primary sources, images, models) to create an understanding of a topic?
5. When you are interacting with texts in your discipline with the purpose of learning new information, how likely are you to view texts as a source of factual information?
6. When you are interacting with texts in your discipline, how likely are you to view the text as an authority on the subject?
7. When you are interacting with texts in your discipline, how likely are you to view the text as an argument the author is creating?
8. When you are interacting with texts in your discipline, how likely are you to consider the author’s point-of-view when reading the text?
9. When you are interacting with texts in your discipline, how likely are you to consider the author's
Teachers’ Use of Strategies to Make Sense of Text

Purpose for writing the text as you read the text?

Directions: As you answer the following questions:

- think about how you use text to learn in your discipline (science, math, social studies, or English/language arts).
- when you think of the term text, consider a broad definition. That is, text is anything that brings a message to someone. For example, text could be a movie, an illustration, an equation, a formula, a poem, a song, an article, or a lecture.

[Very Likely, Likely, Undecided, Unlikely, Very Unlikely]

1. When you are interacting with texts in your discipline, how likely are you to utilize prior knowledge to make meaning from the text?
2. When you are interacting with texts in your discipline, how likely are you to set a purpose to read the text?
3. When you are interacting with texts in your discipline, how likely are you to preview the text prior to reading the text?
4. When you are interacting with texts in your discipline, how likely are you to use the structure of the text to aid your comprehension of text?
5. When you are interacting with texts in your discipline, how likely are you to interpret graphics and images?
6. When you are interacting with texts in your discipline, how likely are you to investigate patterns present in the materials?
7. When you are interacting with texts in your discipline, how likely are you to make generalizations about the topics/concepts present in the text?
8. When you are interacting with texts in your discipline, how likely are you to read texts in order from start to finish?
9. When you are interacting with texts in your discipline, how likely are you to focus on the accuracy of the information present in the text?
10. When you are interacting with texts in your discipline, how likely are you to focus on the precise
terminology present in the text?

11. When you are interacting with texts in your discipline, how likely are you to focus on how precisely the information is presented?

12. When you are interacting with texts in your discipline, how likely are you to create a drawing to aid comprehension?

13. When you are interacting with texts in your discipline, how likely are you to write as you read to aid comprehension?

14. When you are interacting with texts in your discipline, how likely are you to make predictions about the topic as you are reading?

**Teachers’ Considerations for Planning for Instruction**

Directions: As you are answering the following questions, consider yourself in your role as a teacher. Rank your confidence regarding the following statements.

[Very Confident, Confident, Undecided, Unconfident, Very Unconfident]

1. Rank your confidence in teaching students how to use the structure of the text to aid comprehension.

2. Rank your confidence in teaching students how to construct arguments about a topic.

3. Rank your confidence in teaching students how to critique the arguments of others.

4. Rank your confidence in teaching students how to solve problems in using real-world scenarios.

5. Rank your confidence in teaching students how to use more than one text to verify an idea presented in a text.

6. Rank your confidence in teaching students how to use more than one type of text when building an understanding of a topic.

7. Rank your confidence in selecting texts with diverse formats such as graphs, images, and visuals for students to read and interpret independently.

8. Rank your confidence in being able to provide students with sets of texts they can use to independently answer a question.
### Teachers’ Views of Students’ Abilities to Engage in Habits of Thinking

Directions: Consider your students as you answer the following questions. [Very Confident, Confident, Undecided, Unconfident, Very Unconfident]

1. Rank your confidence in your students’ ability to identify a pattern present in a problem.
2. Rank your confidence in your students’ ability to use terms in your discipline with precision.
3. Rank your confidence in your students’ ability to use appropriate, discipline-specific terminology when discussing a topic.
4. Rank your confidence in your students’ ability to draw conclusions from text independently.
5. Rank your confidence in your students’ ability to cite evidence to support an idea.
6. Rank your confidence in your students’ ability to use evidence drawn from the text.
7. Rank your confidence in your students’ ability to analyze the development of an event or character over time in the text.
8. Rank your confidence in your students’ ability to compare approaches taken by two or more authors on a text.
9. Rank your confidence in your students’ ability to analyze how point-of-view or purpose shapes a text.
10. Rank your confidence in your students’ ability to analyze how reading for a specific purpose shapes a text.
11. Rank your confidence in your students’ ability to follow a multistep procedure.

### Demographics

Directions: Please answer the following questions.

1. Which of the following subject areas are you certified to teach? (English/language arts, mathematics, social studies, science).
2. What is the highest level of education you have completed? (bachelor, master’s, second master’s, certificate of advanced study, doctorate).
3. Which of the following subject areas do you currently teach? (English/language arts, mathematics, social studies, science).
studies, science).
4. How many years have you been teaching in that subject area?
5. How many professional development sessions have you participated in on the topic of disciplinary-literacy instruction? (none, one or two, three or four, five or six, more than seven)
6. How many courses have you had on the topic of disciplinary literacy? (none, one or two, three or four, five or six, more than seven)
7. Which best describes the level of student you primarily teach? (honors, advanced placement, core classes, remedial classes)
8. Male or female
APPENDIX E

THINK-ALOUD PROTOCOL
Think-Aloud Protocol (Geisler, 1994; Peskin, 1998)

Directions (to be read aloud by the researcher):

I’d like you to think aloud as you construct a unit plan. A unit plan is any sequence of two or more lessons on a topic. As you are writing your plan, say everything that you are thinking. It’s just as if you are “turning up the volume” on your ideas, questions, and any thoughts as they pass through your mind. Don’t censor anything. I am going to use this video recorder to record your thoughts. Once the recording has been transcribed, I will email you a copy of the transcripts so that you may review them and offer any necessary adjustments to the transcripts of this recording.

Take as much time as you’d like when planning. I will stop recording after two hours have passed, whether you have completed the unit plan or not. If you haven’t completed the plan, I will ask you questions during our follow-up interview that will allow you to explain how you would complete the plan if you had more time.

Because the process of thinking aloud can initially seem unnatural, please first walk me through checking your email. This will allow us to practice the protocol and make sure we’re both comfortable before we begin.

Before you begin planning, please describe the course you are teaching, the level of the students, and the purpose you have set for this unit.

Please gather any materials you might need, and begin planning when you’re ready.

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During the think-aloud, if the participant is not sharing his or her thinking for a period of two minutes, the researcher will probe him or her with statements such as:

- Please share your thinking.
- Please share your thoughts.
- Please feel free to speak as you are working.
- Share anything that’s running through your mind at this moment.

The researcher will also place an index card with “Share your thinking” written on it on the participant’s work space.
Think-Aloud Participant Copy

I’m going to ask you to think-aloud while planning a lesson for instruction.

- I define a unit as two or more lessons on a topic.
- I will ask you to share your thinking. I want you to turn up the volume in your mind and share what you are thinking as you are planning.
- I will record your thoughts with this video camera and audio recorder.
- Take as much time as you’d like while planning. I will stop you at two hours. You’ll be able to explain how you would finish planning if we run out of time.
- To practice, please think-aloud as you walk me through checking your email.
- I will email you a copy of the transcribed video for your review prior to data analysis.

Researcher’s thought probes:

1. Please share how you selected these texts. Or, how did you decide to use these texts?
2. What are your objectives for this unit?
3. What are your assessments for this unit?
4. How will you deliver instruction?
APPENDIX F

SEMISTRUCTURED INTERVIEW QUESTIONS
Semistructured Interview Questions

If the participant has completed the unit plan, the researcher will skip to Question 2. If the participant has not completed the unit plan within the two-hour time frame, the first question will be:

1. I realize that we ran out of time. Walk me through how you would complete planning this unit.

2. Is this typical of the way you usually plan a unit? If so, how? If not, what was different?

3. How satisfied are you with the plans? Explain.
   a. Looking back, is there anything you would change, omit, or add?

4. Think of the lessons you planning in this unit. Remind me of which texts you will use. How are these texts selected?

5. Now, thinking of lesson planning in general, do you regularly incorporate literacy instruction into your courses?
   a. If so, how? If not, why not?

6. Also thinking about your teaching in general, what is your biggest challenge in helping students interact with text?

7. When you are thinking of yourself as one who interacts with text in your discipline, not your discipline of teaching but your discipline of [insert teacher’s discipline], how would you describe your own interactions with text in your discipline?
   a. When you think of the term text, consider a broad definition. Text is anything that brings a message to someone (a movie, an illustration, an equation, a formula, a poem, a song, an article, or a lecture. (Possible following-up/prompting questions.)
      i. How likely are you to rely on the text’s structure?
      ii. How likely are you to consider the author and credibility of the source?
      iii. How likely are you to rely on more than one text when studying a topic?
      iv. How likely are you to view the source as an argument?
      v. How likely are you to consider the author’s purpose for writing the text?
8. When you are interacting with texts in your discipline, do you find yourself relying on strategies? If so, describe the strategies you might use when interacting with texts in your discipline.

(Possible follow up questions.)

a. How likely are you to set a purpose to read the text?
b. How likely are you to investigate patterns present in the materials?
c. How likely are you to utilize prior knowledge to make meaning from the text?
d. How likely are you to preview the text prior to reading?
e. How likely are you to read texts sequentially?
f. How likely are you to create a drawing or take notes to aid comprehension?

9. Now I’d like you to think of yourself in your role as a teacher. Describe how you feel about your own ability to help students read and write in your discipline. (Possible follow up).

a. How confident are you in teaching students how to solve problems in real world scenarios?
b. How confident are you in teaching students how to critique the reasoning of others?
c. How confident are you in selecting appropriate texts for your students?

10. Describe how you feel about your students’ ability to comprehend the texts in your discipline.

(Possible follow-up)

a. How confident are you in your students’ ability to use appropriate terminology when discussing a topic?
b. How confident are you that students can use evidence to support ideas using details from the text?
c. How confident are you in students’ ability to compare two approaches to text?
d. How confident are you in your students’ ability to follow a multistep procedure?

Now I’d like to ask you some information about yourself:

11. What is the highest level of education you have completed?

12. In which areas are you certified to teach?

13. Which classes do you currently teach? For how long have you been teaching these classes?
14. In general, which level of courses do you teach most often?

15. How many courses in disciplinary literacy have you taken?

16. Describe how many hours, if any, of professional development you’ve participated in related to the topic of disciplinary literacy.