Doctoral Students' Perceptions of Barriers to Reading Empirical Literature: A Mixed Analysis

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Abstract

Little is known about reading ability among doctoral students. Thus, we used a multi-stage mixed analysis to examine 205 doctoral students' levels of reading ability, their perceptions of barriers that prevented them from reading empirical articles, and the relationship between these two sets of constructs. Approximately 10% of doctoral students attained reading ability scores that represented the lower percentiles of a normative sample of undergraduate students. A thematic analysis revealed 8 themes (subsumed by 3 meta-themes: *Research Characteristics*; *Comprehension*; *Text Characteristics*) that represented barriers to reading empirical articles and that predicted both perceived and actual reading ability. Combinations of these themes and meta-themes were related to both perceived reading ability and actual reading ability (reading comprehension, reading vocabulary). The implications of these and other findings are discussed and recommendations are provided for helping doctoral students successfully negotiate the path of emergent scholarship.

Keywords: reading, empirical literature, barriers to reading, mixed research, doctoral students, doctoral students' perceptions, emerging scholar, struggling readers

Introduction

Studies of doctoral students seem to have a relatively small representation in the academic literature; yet, even so, there is one clear and compelling point often noted: the attrition rate among doctoral students ranges from 30% to 50% (see, for example, McAlpine & Norton, 2006). More specifically, as many as 50% of doctoral students do not complete their dissertations and, hence, their degree programs (Bowen & Rudenstine, 1992; Cesari, 1990). Further, even within the limited studies that examine doctoral students, the focus tends to center on issues such as graduation rates and provides little insight on what happens to doctoral students along the way. One notable example of a study that does indeed look more closely at the doctoral student experience is Nettles and Millet (2006), who examined issues of socialization, productivity, and financing; yet, an area of doctoral studies that has received little attention is what we consider the emerging scholar.

In providing a rationale for the term *emergent* in the construct of emergent literacy, Teale and Suzlby (1986) noted the importance of emergent as signifying "it is 'forward looking.' It suggests development, that there is a direction in which children are progressing" (p. xx). Thus, just as an emergent reader/writer is continuously making growing discoveries about print, an emergent scholar is continuously making growing discoveries about research. Unfortunately, little is known about this process in doctoral students. Further, the focus in doctoral programs tends to center on mentoring/training students to become producers of research. However, the emerging scholar is learning to become both a consumer and producer of research. In order for emerging scholars to become astute consumers of research, it is necessary to understand a wide range of research methodologies, which requires them to read a vast amount of research in the form of empirical literature, which does not only comprise text but also statistical data and information displays such as tables and figures. In 2003, the U.S. National Assessment of Adult Literacy (NAAL) (Kutner et al., 2007) assessed the three types of literacy that are foundational in becoming critical readers of empirical literature: prose, document, and quantitative. Although the findings indicated that scores increase as a function of educational level, the average score of participants who had either received some graduate level study or a graduate degree still fell well below proficient, which was defined as the level at which a reader is able to perform complex reading tasks. Specifically, only 41% of post-graduate participants were proficient on prose literacy, 31% on document literacy, and 36% on quantitative literacy. Even more disturbing, since 1992, post-graduates' prose and document scores have declined by 10% and 14%, respectively. However, it is important to note that the number of adults who have reached the highest level of education increased during that time period. Perhaps, it is assumed that at the doctoral level, all students fall within the proficient range on all three literacy types and are, therefore, outstanding readers and able to comprehend complex studies. Interestingly, though, virtually no researcher appears to have studied reading ability among doctoral students.

Several researchers have demonstrated a link between reading ability and academic performance among undergraduate students (Lammers, Onwuegbuzie, & Slate, 2001 Van Lanen, Lockie, & McGannon, 2000). For example, Lammers et al. (2001) reported that reading was the weakest area of academic skill among the 366 undergraduate students in their study. Moreover, reading ability consistently has been a significant predictor of academic achievement among undergraduate students (Baker, 1985, 1989; Brown & Day, 1983; Du Boulay, 1999; Van Lanen et al., 2000; Wood, 1982). However, only a few studies have been conducted in which reading ability has been examined among graduate students, likely because their instructors, advisors, and mentors, for the most part, assume that they are competent readers (Collins & Onwuegbuzie, 2002-2003; Onwuegbuzie & Collins, 2002). Yet, evidence appears to contradict this assumption. In particular, in a study containing almost exclusively white graduate students, Collins, Onwuegbuzie, and Jiao (2008c) determined that a significant proportion of graduate students obtained scores pertaining to reading comprehension and reading vocabulary, as measured by the Nelson-Denny Read-

ing Test (NDRT) (Brown, Fishco, & Hanna, 1993), that represented the 14th percentile and 24th percentile, respectively, of a normative sample of 5,000 undergraduate students from 38 institutions. Similarly, in an investigation of a sample of African American graduate students, Collins and Onwuegbuzie (2002-2003) observed that 11.5% of reading comprehension scores and 13.7% of reading vocabulary scores of the graduate students represented the 1st percentile of Brown et al.'s (1993) undergraduate norms.

With the exception of the few studies previously discussed, the reading ability of graduate students typically is not assessed directly via the use of measures of reading comprehension and/or reading vocabulary (cf. Du Boulay, 1999). Rather, in the majority of cases, reading ability among graduate students is indirectly assessed via examination of academic outcomes that are expected to necessitate reading skills. This latter method of assessment has led Du Boulay (1999) to conclude that reading ability is an important predictor of a variety of graduate students' levels of academic performance. Consistent with Du Boulay's contention, reading ability has been found to be a significant predictor of academic achievement among graduate students (Collins et al., 2008c; Onwuegbuzie, Slate, & Swartz, 2001; Zhu, 1999). However, assuming this relationship is causal in nature, it is not clear *how* reading ability might debilitate performance.

One way that reading ability might play a debilitative role in the graduate learning context is by reducing the number of important published works that are read by graduate students. Indeed, graduate students have been documented as being approximately 3.5 times more likely than are undergraduate students to report that they nearly always or always procrastinate in maintaining their weekly reading assignments (Onwuegbuzie, 2004). Further, Francis and Hallam (2000) documented that only 7 out of 22 students in a postgraduate masters degree course "were judged as making a clear, coherent statement of the main point(s)" of a text despite the fact that all 22 students had re-read parts of the text (p. 284). In fact, as noted by Walpole, Burton, Kanyi, and Jackenthal (2002), the ability to read and to critique empirical research articles (i.e., articles that involve the collection, analysis, and interpretation of quantitative and/or qualitative data) is an essential outcome of doctoral programs. Thus, identifying the barriers that prevent students from reading empirical research articles is important for instructors and mentors to help graduate students meet the goal of becoming consumers of research literature. Unfortunately, scant information exists about what barriers prevent doctoral students from reading empirical research articles.

Theoretical Framework

The Construction-Integration (CI) Model of comprehension (Bruning, Schraw, Norby, & Ronning, 2004; Kintsch, 1988, 1994, 2004; Kintsch & Welsch, 1991) explains how readers develop content-specific knowledge in a field via reading challenging texts. This interactive, multi-level model of text comprehension, which Tracey and Morrow (2006, p. 155) note is consistent with both cognitive processing and constructivist theories, suggests that a reader's prior knowledge and a challenging text coalesce in helping readers build vocabulary and knowledge and understanding of domain-specific concepts as they read (Kintsch, 1994). The CI Model posits that, as readers read, they interact with text and develop meaning by constructing "mental representations" (Kintsch, 2004, p. 1271) of what they have read. This process encompasses all levels of text interaction from the reader's initial encounter with the text that includes basic decoding of words through complex synthesis of the information found in the text.

The readers' representations of the text occur at three hierarchical, yet recursive, levels: (a) the *linguistic level* (the specific words and the sentences); (b) the *semantic level* (the actual meaning generated from the individual words and the sentence constructions); and (c) the *situational level* (the meaning of the text that is generated in combination with the text and the reader's background knowledge) (Kintsch & Welsch, 1991, pp. 369-370). The two cognitive processes utilized to construct these three representations occur when the reader forms a text-base (construction)

and a mental model (integration) (Kintsch, 1994; Tracey & Morrow, 2006). At the phase of construction, a variety of resources are utilized including (a) the text, (b) the reader's purpose and interest, (c) and the reader's knowledge of text attributes such as vocabulary, syntax, and genre (Kintsch, 1988, 1994). At the phase of integration, the idea units (propositions) combine with the reader's prior knowledge (or schema) to promote synthesis (Kintsch, 1994, 2004).

Thus, schema plays an important role in the CI model. Schema is the knowledge that influences the organization and interpretation of the world around us (Anderson & Pichert, 1978; Axelrod, 1973). To acquire new information or knowledge, a "balance" between old and new information must be established (Axelrod, 1973, p. 1248). Anderson, Reynolds, Schallert, and Goetz (1977) explain that the meaning of words come from the meshing of prior knowledge with new knowledge. The analysis and interpretation of text is dependent upon the balance that can be established when the person creates a link and incorporates old and new knowledge together. Interpretation of a text is dependent upon a person's prior experience and, therefore, can be adapted and defined to have separate meanings to several different people. Anderson et al. (1977) demonstrated this phenomenon by having 30 undergraduate students read two passages that could be interpreted in two distinct manners, depending upon the schema of the participants. Analysis of the data indicated that "…people's personal history, knowledge and belief influence the interpretations that they will give to prose passages" (p. 376).

Numerous researchers have investigated and concluded that the interpretation of written text is dependent on the individuals' experiences, culture, and prior knowledge (Anderson & Pichert, 1978; Anderson, Spiro, & Anderson, 1978; Elio & Anderson, 1981; Steffesen, Joag-Dev, & Anderson, 1979). As a result, individuals will generally transfer, generalize, or attempt to fit information if it does not conform into the schema or prior knowledge that is brought to the text that is being read (Carrel, 1984; Carrel & Eisterhold, 1983). Bearing in mind that a large amount of text that readers encounter in research articles is new, their schema, or lack of schema, is an important consideration in how they integrate text to construct meaning.

The Current Study

As noted previously, most of the research in the area of reading ability among students enrolled in institutions of higher education has occurred at the undergraduate level. Of those studies conducted at the graduate level, the samples have involved either exclusively or predominantly master's students (e.g., Collins & Onwuegbuzie, 2002-2003, 2007; Collins, Onwuegbuzie, & Jiao, 2008a, 2008b, 2008c; Jiao & Onwuegbuzie, 2003; Onwuegbuzie & Collins, 2002; Onwuegbuzie et al., 2004; Onwuegbuzie et al., 2001; Zhu, 1999). Virtually, no researcher appears to have studied reading ability among doctoral students. Moreover, bearing in mind their potential to study complex phenomena, what is lacking from studies conducted at the graduate level are mixed research studies that involve "mix[ing] or combin[ing] quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (Johnson & Onwuegbuzie, 2004, p. 17).

This study was conceptualized and conducted using the framework developed by Collins, Onwuegbuzie, and Sutton (2006). Their framework for mixed research involves 13 methodological steps that are grouped within three stages: the *Formulation Stage*: (1) determining the mixed goals, (2) formulating the mixed research objective(s), (3) determining the rationale for the study and the rationale(s) for mixing approaches, (4) determining the purpose of the study and the purpose(s) for mixing quantitative and qualitative approaches, (5) determining the mixed research question(s); the *Planning Stage*: (6) selecting the mixed sampling design, (7) selecting the mixed research design; and the *Implementation Stage*: (8) collecting quantitative and/or qualitative data, (9) analyzing the quantitative and/or qualitative data, (10) validating/legitimating the mixed research findings, (11) interpreting the mixed research findings, (12) writing the mixed research

report, and (13) reformulating the mixed research question(s).These 13 steps are interactive and recursive. As noted by Leech, Collins, Jiao, and Onwuegbuzie (2010), "Using these interactive steps to formulate, plan, and implement a mixed research study informs the researchers' decisions relative to drawing quality meta-inferences (integration of inferences derived from the quantitative and qualitative study components)…and formulating appropriate generalizations" (p. 5). Thus, these 13 methodological steps provide the organizational framework for this paper. The formulation stage, which includes Steps 1-5, follows this section, whereas the steps in the planning and implementation stages are embedded in the Method, Results, and Discussion sections of the article.

Formulation Stage

The goal (Step 1) of the present mixed research study was to have a personal, institutional, and/or organizational impact on future doctoral programs (Newman, Ridenour, Newman, & DeMarco's, 2003). The objectives (Step 2) of this mixed research study for the quantitative phase were description and prediction and for the qualitative phase were exploration and description, with all four objectives being pertinent in the mixed research phase. The rationale for mixing (Step 3) was derived from Collins et al.'s (2006) rationale and purpose (RAP) model and included:(a) participant enrichment, motivating students to take ownership over the data they and their classmates were providing; (b) instrument fidelity, using quantitative and qualitative data to develop and questionnaire; and (c) significance enhancement, collecting a combination of qualitative and quantitative data to obtain richer data than otherwise would have been obtained using only one type of data (Onwuegbuzie & Leech, 2004). The purposes for mixing (Step 4) were complementarity (using quantitative and qualitative techniques to measure the many aspects of a phenomenon resulting in more rich and elaborate data) and expansion (increasing the breadth of the study by using different methods to assess different components of the inquiry). The questions (Step 5) guiding this study represented quantitative, qualitative, and mixed research questions.

Quantitative research questions

1. What is the level of reading comprehension among doctoral students?
2. What is the level of reading vocabulary among doctoral students?

Qualitative research question

3. What are the perceived barriers to reading empirical articles of doctoral students?

Mixed research questions

4. What is the prevalence of each of the perceived barriers to reading empirical articles of doctoral students?
5. How do these perceived barriers to reading empirical articles relate to one another?
6. What is the relationship between reading ability (i.e., reading comprehension, reading vocabulary) and perceived barriers to reading empirical articles of doctoral students?
7. Which perceived barriers predict the levels of perceived difficulty doctoral students experience in reading empirical research articles?

Method

Participants and Setting

The participants were 205 doctoral students enrolled in either a mixed research design or an advanced qualitative research design course housed in the College of Education at a large Tier 1

research university in the southern United States. These students were enrolled in 32 doctoral degree programs that represented the college. A slight majority of participants was female (n = 121, 59.2%). Also, the majority of the participants was White (n = 130, 63.4%), followed by American Indian or Alaskan Native (n = 30, 14.6%), Hispanic (n = 18, 8.8%), African American (n = 14, 6.8%), and Asian (n = 10, 4.9%). The vast majority (86.8%) of participants was native English speakers (n = 178). They ranged in age from 22 to 56 years (M = 40.88, SD = 9.81). Pertaining to degree being sought, the majority of students was pursuing a Ph.D. (84.9%), with the remaining students pursuing an Ed.D. (15.1%). The mean grade point average (GPA) of the participants was 3.80 (SD = 0.21).

Step 6: Mixed sampling scheme

Because all 205 participants contributed to both the qualitative and quantitative phases of the study, and the qualitative and quantitative data were collected concurrently, the mixed sampling design used was a Concurrent Design using Identical Samples (Onwuegbuzie & Collins, 2007).

Step 7: Mixed research design

Using Leech and Onwuegbuzie's (2009) typology of mixed research designs, this study was classified as a fully mixed concurrent equal status design because (a) the qualitative and quantitative approaches were mixed within multiple stages of the research process, namely, the data collection, data analysis, and data interpretation stages; (b) the initial quantitative and qualitative data were collected and analyzed simultaneously, and (c) both phases were given approximately equal weight.

Instruments and Procedures

Step 8: Mixed data collection

On the first day of class, all participants were administered the following two instruments: the NDRT and the Reading Interest Survey (RIS). The NDRT is a U.S.-normed and widely used assessment of reading ability. The RIS contains 62 items that are either open-ended (e.g., "What barriers prevent you from reading more empirical research articles?") or closed-ended (e.g., "Please indicate your perceptions about the levels of ease/difficulty you experience in reading empirical research articles" using a 4-point Likert-format scale).

Data Analysis

A sequential mixed analysis (SMA) (Onwuegbuzie & Teddlie, 2003; Tashakkori & Teddlie, 1998) was conducted to analyze doctoral students' test score data and survey responses. This analysis involved the use of both qualitative and quantitative data analysis procedures in a sequential manner—specifically, an iterative manner—commencing with quantitative analyses, followed by qualitative analyses that built upon the quantitative analyses, followed by quantitative analyses of the qualitative data. This sequence of analysis involved abductive reasoning that oscillated between inductive reasoning and deductive reasoning (Morgan, 2007). The SMA consisted of six stages that comprised descriptive, exploratory, or confirmatory analyses.

In the first descriptive analysis (i.e., Stage 1 analysis), reading comprehension and reading vocabulary scores were computed and compared to the normative data (Research Questions 1 and 2). An exploratory analysis then was undertaken to examine the doctoral students' perceptions of barriers that prevented them from reading empirical articles (i.e., Stage 2 analysis). This process, modified from Colaizzi's (1978) analytic methodology, included the following: (a) all the students' words, phrases, and sentences were read repeatedly in order to become familiar with them;

(b) these students' responses then were *unitized* or separated into parts (Glaser & Strauss, 1967); (c) these units of information then were used in order to extract a set of nonrepetitive, nonoverlapping significant statements, and units were eliminated that contained the same or similar statements such that each unit corresponded to a unique perception; (d) meanings were formulated by explicating the meaning of each significant statement; and (e) clusters of themes were organized from the aggregate formulated meanings, with each cluster consisting of units that were considered to be similar in content; consequently, each cluster represented a unique emergent theme.

More specifically, the researchers compared each subsequent significant statement with previous codes such that similar clusters were labeled with the same code. After all the data had been coded, the codes were grouped by similarity, and a theme was identified and documented based on each grouping such that each significant statement was linked to a formulated meaning and to a theme (Glaser & Strauss, 1967).

These clusters of themes were compared to the original descriptions for the purpose of verifying the clusters (Leech & Onwuegbuzie, 2007). This was undertaken in order to ensure that no original statements made by the doctoral students were unaccounted for by the cluster of themes and that no cluster contained units that were not original statements. In addition, peer debriefing was used to legitimize the data interpretations. For this study, the remaining researchers served as the peer debriefers, whose goal was to examine the audit trail (Lincoln & Guba, 1985) to ensure that the interpretations stemmed directly from the data. This process continued until the researchers reached 100% agreement on the themes.

Next, in an exploratory analysis (i.e., Stage 3 analysis), each theme from the previous analysis was *quantitized* (Tashakkori & Teddlie, 1998) to analyze the hierarchical structure of the emergent themes (Onwuegbuzie & Teddlie, 2003). Specifically, if a doctoral student listed a characteristic that was eventually unitized under a particular theme, then a score of "1" was given to the theme for the student response; a score of "0" was given otherwise. Percentages were computed to determine the prevalence rate of each theme (Research Question 4).

An additional exploratory analysis (i.e., Stage 4 analysis) involved the use of the inter-respondent matrix of themes to conduct a principal component analysis to ascertain the underlying structure of the emergent themes (Research Question 5). An orthogonal (i.e., varimax) rotation was employed, in which the eigenvalue-greater-than-one rule (i.e., K1) (Kaiser, 1958) and *scree* test were used to determine an appropriate number of factors to retain (i.e., meta-themes) (Kieffer, 1999). These factors, or latent constructs, represented *meta-themes* (Onwuegbuzie, 2003) such that each meta-theme contained one or more of the emergent themes. The meta-themes extracted via the principal components analysis then were quantitized to dichotomous data (i.e., "0" vs. "1"), yielding an inter-respondent matrix of meta-themes (Onwuegbuzie, 2003).

A confirmatory analysis (i.e., Stage 5 analysis) was used to examine the multivariate relationship between the themes and the reading ability variables (Research Question 6), which included two canonical correlation analyses (Cliff & Krus, 1976; Darlington, Weinberg, & Walberg, 1973; Thompson, 1980, 1984). For each statistically significant canonical coefficient, standardized coefficients and structure coefficients were computed. Similarly, the second canonical correlation analysis was conducted to examine the multivariate relationship between the meta-themes extracted and the reading ability variables.

The final confirmatory analysis (i.e., Stage 6 analysis) involved the use of a discriminant analysis to determine which of the themes predicted the perceived difficulty that doctoral students experience in reading empirical research articles (Research Question 7). Specifically, a canonical discriminant analysis was conducted. As with the canonical correlation analyses, standardized coefficients and structure coefficients were computed.

Step 9: Results

Stage 1: SMA Descriptive Findings

Table 1 presents the mean and standard deviation pertaining to the current sample, the normative undergraduate sample (i.e., Brown et al., 1993), and two master's-level samples (i.e., Onwuegbuzie & Collins, 2002; Onwuegbuzie et al., 2004). The current sample of doctoral students had statistically significantly higher scores on the reading comprehension ($t = 6.84$, $p < .0001$) and reading vocabulary ($t = 11.21$, $p < .0001$) portions of the NDRT than did the normative sample of undergraduate students. The effect sizes, as measured by Cohen's (1988) d, associated with these differences were 0.49 (moderate) and 0.80 (large), respectively. The current sample also had statistically significantly higher reading comprehension ($t = 2.41$, $p < .0001$; $d = 0.32$) and reading vocabulary ($t = 8.73$, $p < .0001$; $d = 1.17$) scores than did the master's-level students in Onwuegbuzie et al.'s (2004) investigation. Finally, the current sample had statistically significantly higher reading vocabulary ($t = 4.47$, $p < .0001$; $d = 0.66$) scores than did the master's-level students in Onwuegbuzie and Collins' (2002) study. However, the doctoral students had lower reading comprehension ($t = -2.78$, $p > .05$; $d = 0.22$) scores than did Onwuegbuzie and Collins' (2002) master's-level students, although this difference was not statistically significant. These findings provide incremental validity to the NDRT. However, disturbingly, approximately 10% of doctoral students attained reading comprehension and reading vocabulary scores that represented the lower percentiles of Brown et al.'s (1993) normative sample of undergraduate students.

Table 1: Means and Standard Deviations Pertaining to Reading Comprehension and Reading Vocabulary Achievement across Studies

Study	*n*	Reading Comprehension		Reading Vocabulary	
		M	*SD*	*M*	*SD*
Current Study	205	67.94	6.78	73.58	5.95
Brown et al. (1993)	5,000	61.60	11.94	64.56	11.46
Onwuegbuzie et al. (2004)	77	65.02	8.20	65.00	10.19
Onwuegbuzie & Collins (2002)	59	70.00	5.28	69.63	6.09

Stage 2 and Stage 3: SMA Exploratory Theme-Related Findings

A total of eight emergent themes were identified that represented perceived barriers to reading empirical literature: time, research/statistics knowledge, interest/relevance, text coherence, vocabulary, prior knowledge, reader attributes, and volume of reading. Table 2 presents these eight themes, together with their corresponding significant statements, formulated meanings, and prevalence rates of each theme (Onwuegbuzie, 2003; Onwuegbuzie & Teddlie, 2003) Interestingly, time was the most endorsed theme, with three fourths of participants (i.e., 75.6%) providing a response that fell into this category. The time theme was followed by the reading/statistics knowledge theme and the interest/relevance theme, with identical endorsement rates by just under half of the participants. Volume of reading was the least endorsed theme, with a prevalence rate of approximately 5%.

Table 2: Stage 2 and 3 Analysis: Themes, Frequencies, Formulated Meanings and Selected Examples of Statements of Doctoral Students' Perceptions of Barriers to Reading Empirical Articles

Theme	Frequency %	Formulated Meaning	*Sample Participant Statements*
Time*	75.6	All obligations and activities—including family-, employment-, leisure-, and school-related activities—that consume time and limit the amount of time for reading	*Time—work, school, family, home ownership* *I have a limited amount of time to which I can commit to reading*
Interest/ Relevance	46.3	Lack of interest about the topic and perception that the reading is/is not important to the respondents' field of study	*Lack of interest in the topic* *Sometimes lack of relevancy to work*
Prior Knowledge	46.3	Familiarity with the topic	*Adequate background knowledge for particular topic*
Research Knowledge/ Statistics	33/7	Being cognizant of and experienced with research skills including methods, designs, library searches Language pertaining to statistical procedures and data analysis	*When they refer to analyses we have not yet learned* *Knowledge of the statistics - methodologies use*
Vocabulary	23.9	Academic expressions, research-related terminology, and terminology specific to particular fields of study	*Understanding the jargon and vocabulary specific to the field and the method of inquiry*
Reader Attributes	9.8	The respondents' perception of their abilities to read and to comprehend empirical literature	*They are usually lengthy and require deep concentration to maintain focus.* *Slow reading speed*
Text Coherence	7.3	The organization of the text, textual supports (i.e., headings, subheadings, tables), how well the parts of the text (i.e., words, sentences, paragraphs) connect to create a clear representation for the reader	*There are figures and tables and charts; familiarity with format of presentation* *The density of the material, writing style (trying to be too academic)*
Volume of Reading	4.9	The amount of reading required in the respondents' daily lives	*I have a tremendous amount of reading to do for my three classes as well as for the class I teach.*

*Time was the only emergent theme that was not considered as representing a reading-based variable.

Stage 4: SMA Exploratory Meta-Themes Findings

A principal component analysis was used to determine the number of factors underlying seven of the eight themes. The time theme was excluded from this analysis because the responses focused more on life issues (e.g., family, church, coursework) and not reading-related issues (e.g., statis-

tics, vocabulary, familiarity with content). The eigenvalue-greater-than-one rule, also known as K1 (Kaiser, 1958), was used to determine an appropriate number of factors to retain. The *scree* test, which represents a plot of eigenvalues against the factors in descending order (Cattell, 1966; Zwick & Velicer, 1986), also was used to determine the number of factors to retain. A cutoff correlation of 0.3 was used, as recommended by Lambert and Durand (1975) as an acceptable minimum value for pattern/structure coefficients.

This technique resulted in three factors (i.e., meta-themes): *Research Characteristics* (Factor 1), *Comprehension* (Factor 2), and *Text Characteristics* (Factor 3). This three-factor solution is presented in Table 3. Interestingly, within the *Comprehension* meta-theme, prior knowledge was negatively related to both vocabulary and reader attributes, indicating that doctoral students who were more likely to cite vocabulary and reader attributes as barriers were less likely to cite prior knowledge as a barrier. The descriptions of each of the three meta-themes are presented in Table 4.

Table 3: Stage 4: Summary of Themes and Factor Pattern/Structure Coefficients from Principal Component Analysis (Varimax): Three-Factor Solution

Theme	Factor Coefficients[1]			Communality Coefficient
	1	2	3	
Research/Statistics Knowledge	.99	.01	-.05	.98
Interest/Relevance	.99	.01	-.05	.99
Prior Knowledge	-.01	-.65	.07	.43
Vocabulary	-.06	.60	.55	.67
Reader Attributes	.03	.58	-.36	.47
Text Coherence	-.20	-.02	.61	.41
Volume of Reading	.13	-.21	.57	.39
Trace	2.03	1.17	1.14	4.34
% variance explained	29.03	16.65	16.22	61.89

[1]Coefficients in bold represent pattern/structure coefficients with the largest effect size within each theme using a cut-off value of 0.3 recommended by Lambert and Durand (1975)

**Table 4: Stage 4 Analysis: Description of Meta-Themes Emerging
from Principal Component Analysis**

Meta-Themes	Themes	Descriptions
Research Characteristics	Research Knowledge/Statistics Interest/Relevance	These factors represent respondents' thoughts about their understanding (or lack of understanding) of research design, methods, and analysis and their views about the significance of research.
Comprehension	Prior Knowledge Vocabulary Reader Attributes	These factors comprise aspects of the respondents' abilities to construct meaning from text.
Text Characteristics	Text Coherence Volume of Reading	These are text-based factors that include issues related text.

Stage 5 and Stage 6: SMA Confirmatory Analysis Findings

The first canonical correlation analysis, which examined the relationship between the seven reading-related themes and the two reading ability variables, revealed that the first canonical function was statistically significant ($F[12, 394] = 1.58$, $p< .05$; Canonical $R_{c1} = .16$) (Cohen, 1988). Data pertaining to the first canonical root are presented in Table 5. The standardized canonical function coefficients revealed that vocabulary and reader attributes made important contributions to the set of themes. With respect to the reading ability set, both reading vocabulary and reading comprehension made noteworthy contributions, with reading vocabulary making by far the greatest contribution. The structure coefficients pertaining to the first canonical function revealed that vocabulary and reader attributes again made important contributions to the first canonical variate. With regard to the reading ability cluster, only reading vocabulary made a noteworthy contribution.

**Table 5: Stage 5: Canonical Solution for First Function: Relationship
between the Seven Themes and the Two Reading Ability Variables**

Variable	Standardized Coefficient	Structure Coefficient	Structure^2 (%)
Theme:			
Interest/relevance	-.18	-.16	2.6
Research/statistics	.01	-.16	2.6
Prior knowledge	-.18	-.27	7.3
Vocabulary	.60*	.65*	42.3
Reader attributes	.66*	.72*	51.8
Volume of reading	.19	.15	2.3
Text coherence	-.19	-.18	.2
Reading Ability:			
Reading Vocabulary	-1.11*	-.95*	90.3
Reading Comprehension	0.36*	-.14	2.0

*Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

The second canonical correlation analysis, undertaken to examine the relationship between the three meta-themes and the two reading ability variables, revealed that the first canonical function was statistically significant ($F[6, 400] = 4.37$, $p < .001$; Canonical $R_{c1} = .34$) (Cohen, 1988). Data pertaining to the first canonical root are presented in Table 6. The standardized canonical function coefficients revealed that all three meta-themes made important contributions to the set of themes —with *Research Characteristics* being the major contributor. With respect to the reading ability set, both reading vocabulary and reading comprehension made noteworthy contributions, with reading comprehension making the largest contribution. The structure coefficients pertaining to the first canonical function also revealed that all three meta-themes made important contributions to the set of themes—with *Research Characteristics* again being the major contributor. Interestingly, for both the standardized and structure coefficients, the *Research Characteristics and Text Characteristics* meta-themes were negatively related to the *Comprehension* meta-theme. Further, the reading vocabulary variable was negatively related to the reading comprehension variable.

Table 6: Stage 5: Canonical Solution for First Function: Relationship between the Three Meta-Themes and the Reading Ability Variables

Variable	Standardized Coefficient	Structure Coefficient	Structure^2 (%)
Meta-Theme:			
Research Characteristics	0.86*	.80*	64.0
Comprehension	-0.38*	-.41*	16.8
Text Characteristics	0.48*	.33*	10.9
Reading Ability:			
Reading Vocabulary	0.66*	.16	2.6
Reading Comprehension	-1.11*	-.81*	65.6

*Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

The first canonical discriminant analysis, conducted to determine which of the themes predicted the perceived difficulty that doctoral students experience in reading empirical research articles, revealed that the first canonical function was statistically significant (Canonical $R_{c1} = .36$) (Cohen, 1988). Data pertaining to the first canonical root are presented in Table 7. The standardized canonical function coefficients revealed that the following themes discriminated reading experience: reader attributes, interest/relevance, and vocabulary—with reader attributes making the largest contribution. The structure coefficients revealed that the following themes made an important contribution to its own set: reader attributes, interest/relevance, vocabulary, and research/statistics—with reader attributes again making the largest contribution. All three variables that had consistently significant standardized and structure coefficients had positive coefficients, which indicated that the doctoral students who cited reader attributes, interest/relevance, and vocabulary as barriers that prevented them from reading empirical articles also tended to find it difficult or somewhat difficult to read empirical research articles.

Table 7: Stage 6: Discriminant Analysis: Function 1: Standardized Canonical Discriminant Function and Structure Matrix for Themes Predicting Perceived Difficulty that Doctoral Students Experience in Reading Empirical Research Articles

Theme	Standardized Canonical Discriminant Function	Structure Matrix
Reader attributes	.72[*]	.70[*]
Interest/relevance	.59[*]	.48[*]
Vocabulary	.48[*]	.44[*]
Text coherence	.18	.01
Prior knowledge	-.02	-.12
Volume of reading	.01	-.01
Research/statistics	.01	.48[*]

*Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

The second canonical discriminant analysis, conducted to determine which of the meta-themes predicted the perceived difficulty that doctoral students experience in reading empirical research articles, revealed that the first canonical function was statistically significant (Canonical R_{c1} = .29) (Cohen, 1988). Data pertaining to the first and second canonical root are presented in Table 8. The standardized canonical function coefficients and structure matrix revealed that the following two meta-themes discriminated level of difficulty reading empirical articles: research characteristics and comprehension, with the positive coefficients for both indicating that the doctoral students who made statements regarding barriers that prevented them from reading empirical articles that fell into one of these two meta-themes also tended to find it difficult or somewhat difficult to read empirical research articles.

Table 8: Stage 6: Discriminant Analysis: Function 1: Standardized Canonical Discriminant Function and Structure Matrix for Meta-Themes Predicting Perceived Difficulty that Doctoral Students Experience in Reading Empirical Research Articles

Meta-Theme	Standardized Canonical Discriminant Function	Structure Matrix
Research Characteristics	.72[*]	.60[*]
Comprehension	.79[*]	.71[*]
Text Characteristics	.16	.04

*Coefficients with the effect sizes larger than .3 (Lambert & Durand, 1975).

Discussion

Step 10: Validating/Legitimating the Findings

As with the case with all research findings, we recognize that threats to descriptive validity (i.e., accuracy of the account), interpretive validity (i.e., researchers' representations of the participants), internal validity (e.g., instrumentation), and external validity exist (Campbell, 1957; Campbell & Stanley, 1963; Onwuegbuzie, 2003). Perhaps, though, the greatest limitation of this study is that the sample represented doctoral students at a single university. Thus, it is not clear the extent to which the present findings generalize beyond the sample to doctoral students from

other institutions in other regions of the United States. Further, in considering the differences in educational systems in other countries, it seems unwise to generalize these findings beyond the United States. However, the notion that this study involved more than 200 participants and exceeds the recommended sample size to determine statistical significance is noteworthy.

In considering the limitations of this study, the researchers used the typology outlined by Onwuegbuzie and Johnson (2006) to address legitimation types in mixed research. Specifically, using large and identical samples for both the qualitative and quantitative approaches maximized sample integration legitimation. Inside-outside legitimation was optimized by capturing the participants' quantitative and qualitative data (i.e., insiders' views), as well as comparing their quantitative data (i.e., reading ability scores) to normative data and data from master's-level students (outsiders' data). Including doctoral students on the research team also facilitated the combining of insider and outsider perspectives. Weakness minimization legitimation was improved by integrating descriptive precision (i.e., obtained from the qualitative analyses) with empirical precision (i.e., obtained from the quantitative analyses). Paradigmatic mixing legitimation was enhanced by using a fully mixed research design (Leech & Onwuegbuzie, 2009), as well as by undergoing all major steps of the mixed research process. Commensurability legitimation was improved by using a team of researchers that was diverse with respect to research orientation, position in academe, and research experience. Multiple validities legitimation was enhanced by using the RAP model to optimize participant enrichment, instrument fidelity, and significance enrichment, as well as by using techniques that addressed as many threats to the legitimation of both the qualitative and quantitative findings as possible. Notwithstanding, despite the rigorous nature of the research design, replications of this study are needed to assess the reliability of the current findings.

Step 11: Interpreting the Findings

Although the doctoral students attained reading comprehension and reading vocabulary scores that exceeded both the normative undergraduate sample and the two master's-level samples, a significant proportion of doctoral students attained reading comprehension and reading vocabulary scores that represented the lower percentiles of Brown et al.'s (1993) normative sample of undergraduate students—suggesting that they could be considered struggling readers by doctoral standards. Perhaps even more compelling is the fact that 36% of students reported that they experienced empirical articles to be difficult to some degree.

The constant comparison analysis revealed that the perceptions of barriers that prevent doctoral students from reading empirical articles are multidimensional in nature. Interestingly, the endorsement rates of five of these themes indicated that these barriers are prevalent among doctoral students.

The finding that time received the greatest endorsement, although not necessarily connected with reading factors, is consistent with Tinto's (1993) integration theory of persistence in higher education that proposes two corresponding systems incorporating both the academic and social aspects of student life. As it pertains to the theme of time, in addition to the specific participant response of "time," the researchers coded time as a factor for all responses pertaining to time obligations that would serve as deterrents to students reading more empirical literature (e.g., class work, family, job, leisure pursuits, volunteer activities). Although some responses that were coded for time referenced academic concerns, most responses coded for time referenced non academic (e.g., social) aspects of the students' lives. Tinto (1993) suggests that these elements are correlated. The finding that non-academic time-related obligations emerged in addition to academic-related themes indicates that both the academic and social systems involved in integration play a crucial role in the time management decisions of doctoral students.

In contrast, academic integration provides the stronger link to doctoral student persistence (Lovitts, 1996). Academic integration is achieved through the acquisition of the skill sets necessary to carry out the scholarly work of a doctoral student. Thus, with the remaining themes well aligned to academic integration, specifically to reading factors, they provide more insight into understating the barriers that doctoral students face in reading empirical research.

The first two meta-themes, research characteristics and comprehension, are theoretically similar in that both involve the integration of reader and text-based factors in comprehension. However, what distinguishes the two is that research characteristics are domain specific whereas comprehension is more related to general reading.

The first meta-theme, research characteristics, comprises knowledge of research, interest in research, and the relevance of research. Both research characteristics and interest/relevance were viewed by almost one half of the respondents as a barrier in reading research. Thus, research knowledge represents an important aspect in understanding the barriers to reading research. This meta-theme seems best explained through the CI Model (Bruning et al., 2004; Kintsch, 1988, 1994, 2004; Kintsch & Welsch, 1991). According to this model, in order to build content-specific knowledge, readers construct knowledge about text at three levels: linguistic, conceptual, and situational. However, with knowledge of research as a barrier, this construction of text might be stifled at the situational level, which combines the derived meaning of the text with the reader's prior knowledge. For example, if readers cannot make sense of the data analysis in the text and have limited prior knowledge of statistics, construction of meaning might suffer. Further, if readers find little interest or relevance in the research, they might be less likely to put forth the effort to make sense of the text (see, for example, Worthy, Moorman, & Turner, 1999).

The second meta-theme, comprehension, is complex and is determined by the reader's interaction with the text. Although research conducted on graduate-level students and reading ability is sparse, there is a long history of research establishing links with children between comprehension and vocabulary (e.g., Anderson & Freebody, 1981; Davis, 1944, 1968; Thorndike, 1917) and prior knowledge of content (e.g., Anderson & Pearson, 1984; Anderson et al., 1977; McKeown & Beck, 1990). These links to comprehension suggest that any reader—even a doctoral student— who is given a text laden with unfamiliar vocabulary and unfamiliar content could at any time be a struggling reader.

Yet, interestingly, there was a negative correlation between vocabulary and prior knowledge barriers. This finding suggests that doctoral students seem to perceive one or the other as being a barrier to comprehension. The implication of this finding reveals that when doctoral students consider why empirical research is difficult, they might not be fully embracing the complex integration of text, or more specifically, viewing successful comprehension as an interaction between the reader and the text (see, for example, Bruning et al., 2004; Kintsch, 1988, 2004; Kintsch & Welsch, 1991; Rosenblatt, 1994).

That the theme reader attributes was positively correlated to vocabulary can be explained within Nagy's (2005) metalinguistic hypothesis. This "spin" (Nagy, 2005, p. 32) on the aptitude hypothesis suggests that, given the decontextualized nature of texts like empirical literature, the reader must not only be metacognitively aware but also metalinguistically aware in order to determine when comprehension breaks down. This hypothesis, which is consistent with the CI Model, suggests that a reader must be able to take into consideration the language of the text when making meaning from the text. Therefore, readers' self-reported beliefs about their attributes as readers might be indicative of their metacognitive and metalinguistic abilities and their ability to construct meaning from text.

The third meta-theme, text-based characteristics, included text coherence and volume of reading. Perhaps what is most striking about this meta-theme, that truly sets it apart from the other two

meta-themes, is that doctoral students perceive the barrier exists solely in the text. Although the notion of text coherence, "the extent to which the relationships between ideas in a text are explicit" (McNamara, 2001, p. 51), helps to understand how the level of clarity in text can affect comprehension, the text itself is only one part. That is, research in this area typically examines the coherence of text in relation to the reader's background knowledge, again supporting an integrated model of comprehension (McNamara, 2001; McNamara, Kintsch, Songer, & Kintsch, 1996). However, as evident in this meta-theme, doctoral students do not seem to attribute the barriers to their knowledge. This idea is further supported by considering that two factors from the second meta-theme also had large pattern/structure coefficients in the final principal component analysis solution (although not as high) in this area. One of these factors, vocabulary, is also viewed as an aspect of the text, reflecting the word choices of the authors. The other factor, reader attributes, had a negative relationship with the other text-based factors, suggesting that if doctoral students perceived the barriers to exist in the text, they were less likely to attribute any barriers to their own capabilities as readers.

The multivariate relationship between the seven themes and the reading ability variables was mainly characterized by the relationship between vocabulary and reader attributes on one side and reading vocabulary on the other side. Not surprisingly, vocabulary ability significantly predicted citing vocabulary as a barrier to reading empirical research. Thus, it seems that doctoral students with lower vocabulary levels are indeed aware of this weakness in their reading and are more likely to note vocabulary as a barrier. In addition, with vocabulary ability as a predictor of the reader attributes barrier, it appears that doctoral students with lower vocabulary levels are also more concerned with how their reading abilities might prevent them from reading research.

The canonical correlation analysis also indicated a multivariate relationship between all three meta-themes and reading comprehension. These findings suggest that doctoral students who struggle with comprehension are more likely to note research characteristics and text characteristics as barriers, but less likely to perceive comprehension as a barrier. In considering that the comprehension meta-theme comprises more general reading abilities, it could be that doctoral students who struggle more with comprehension are just more intimidated by the research aspects of the text (e.g., statistics) and the coherence of the text than more basic and general reading skills, and thus more likely to perceive those two meta-themes as barriers. Further, within the meta-themes of research characteristics and text characteristics are both reader and text-based factors, suggesting that lower level comprehension students are aware that barriers exist in both the reader and the text, and that they perceive having difficulty constructing meaning at both the conceptual and situational levels (Bruning et al., 2004; Kintsch, 1988, 2004; Kintsch & Welsch, 1991).

As a set, the seven themes predicted the level of perceived difficulty that doctoral students experience in reading empirical research articles, with the following variables making the most important contributions to this prediction: reader attributes, interest/relevance, and vocabulary. Interestingly both reader attributes and vocabulary were not only predictor variables of perceived reading difficulty, they were also the only two individual variables related to measured reading abilities. This finding supports the idea that, whether doctoral students perceive they will struggle with text or if they truly do struggle with text, they are more likely to attribute this difficulty to their own reading abilities and vocabulary. In addition, relevance/interest was a strong predictor of perceived reading difficulty, suggesting that doctoral students are less likely to think they will struggle with research articles that are related to their fields or of interest to them, consistent with findings emerging from research examining reading and motivation (Guthrie & Wigfield, 1999; Wang & Guthrie, 2004).

With respect to the meta-themes, research characteristics and comprehension predicted level of perceived difficulty. Again, similar to the findings regarding barriers and reading ability, students who perceived they would struggle with research text, or do struggle with text, were more likely

to cite research characteristics as a barrier. Clearly, this indicates that whether reading difficulties are perceived or real, research characteristics (e.g., statistics, data analysis) are factors that intimidate doctoral students in their thinking about reading empirical research.

However, there were also two notable differences between the relationship between the three meta-themes and the reading ability variables and the discriminant analysis for meta-themes predicting perceived difficulty. In the discriminant analysis, doctoral students who perceive that they have difficulties reading empirical articles were *more* likely to indicate that comprehension was a barrier. In contrast, the canonical correlation analysis revealed that doctoral students who actually had lower levels of reading ability were *less* likely to indicate that comprehension was a barrier. This difference suggests that those who believe they will struggle are concerned with all aspects of the text as opposed to just the research characteristics. Finally, with text-based characteristics making only a small contribution, it seems that students who believe they might struggle with reading empirical research do not seem to think the struggle is due to coherence of the text. In essence, they place the responsibility of understanding empirical research upon themselves, as the reader.

Finally, the findings that the two reading ability variables were related to a combination of themes and meta-themes suggest that reading ability might serve as either a moderator or mediator of the barriers that prevent doctoral students from reading empirical articles. Future research should investigate further this potential moderator/mediator role. Mixed research techniques could play an important role here.

Steps 12 and 13: Writing the Mixed Research Report/Re-formulating the Mixed Research Question

Step 12, writing, is encompassed in this article in its entirety and, in considering the recursive nature of mixed research, leads to re-formulating the research questions (Step 13). Researchers in the future might consider addressing the following questions: How does reading ability act as a barrier to reading empirical articles among doctoral students? and How and to what extent can barriers to reading empirical articles be reduced?

Implications for Practice

The current investigation indicates that for doctoral students, reading ability likely plays an important role in the learning context. Moreover, the negative relationship between levels of reading ability and some of the emergent themes suggests that inadequate reading ability can place a student at risk of not learning the skills necessary to be a consumer of research (Ravid & Leon, 1995; Walpole et al., 2002) by not reading key empirical articles. As such, interventions aimed at improving reading ability among doctoral students likely might help to address their research needs.

It might be erroneous to assume that doctoral students enter programs ready to read and to comprehend empirical articles fully. Although doctoral students must meet rigorous acceptance criteria that include measures of reading ability, many are encountering highly specialized texts for the first time. Lundeberg (1987), comparing the reading strategies of expert and novice readers of case law, determined that experts utilized specific strategies when reading material that incorporated their knowledge of the specialized genre of law, knowledge of specialized legal vocabulary, and background knowledge—knowledge that novice readers of law did not have. Upon encountering difficulties in comprehension of the law texts, these novice readers, who Lundeberg reported to be competent readers in their own fields, verbalized their feelings of inadequacy. At first glance, the technical language, format, and text structure of empirical research articles can be just as confusing and almost foreign to doctoral students—leading most students to the same self-

imposed frustration and feelings of incompetence exhibited by the novice readers of law. In turn, these feelings of not being able to excel also might be closely tied to the high attrition rates among doctoral students.

It is important that doctoral program instructors recognize the diversity in reading ability among doctoral students and examine further the reading demands of doctoral-level coursework. In follow-up studies, Lundeberg (1987) provided strategy instruction to first-year law students that utilized the strategies that had been observed in the experts and found that there were significant differences in the comprehension of case law text between students who were trained in strategy use and those who received no training. Doctoral students also might benefit from similar strategy instruction. It is extremely important for directors of doctoral programs to: (a) link the reading abilities, life experiences, and prior knowledge that the student brings to the program; (b) scaffold new information (Pearson & Gallagher, 1983); (c) examine the reading requirements of the program; and (d) adopt reading processes necessary to fulfill successfully those requirements.

Conclusion

The findings from this study provide compelling evidence to support the construct of doctoral students as emerging scholars. Clearly, just as important as it is for educators to provide emergent readers opportunities to interact with print with guidance, it seems also important for instructors, advisors/supervisors, and mentors to provide doctoral students opportunities to interact with empirical research with guidance and support. In considering both the attrition rate among doctoral students (Bowen & Rudenstine, 1992; Cesari, 1990; McAlpine & Norton, 2006) and the growing number of graduate students, along with their declining rates of basic literacy skills (Kutner et al., 2007), the need for intervention is imperative.

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