

Exploring changes to reading comprehension on the Internet: Paradoxes and possibilities for diverse adolescent readers

Does the Internet require new skills and strategies beyond traditional reading comprehension ability and prior knowledge? This mixed-methods study seeks to evaluate the extent to which new reading comprehension skills are required on the Internet. It will first develop a valid and reliable preliminary measure of online comprehension skills. Then, 70 seventh-graders will be randomly selected from three urban middle schools in Connecticut and asked to complete this instrument. Later, students will complete a survey of prior knowledge and an Internet Comprehension Task (ICT) while thinking aloud. A hierarchical regression analysis will be conducted to evaluate the extent to which the use of online reading skills significantly predicts scores on an online comprehension task above and beyond prior knowledge and standardized measures of traditional reading comprehension. Think-aloud protocols from four cases will be analyzed in a cross case-study approach to enrich the interpretation of how online comprehension strategies play out qualitatively among adolescent readers. The expected findings can open new possibilities for theory, research and practice to support efforts that address the needs of diverse struggling readers in new Internet reading contexts.

Exploring changes to reading comprehension on the Internet: Paradoxes and Possibilities for diverse adolescent readers

The paradox of our times is that we do so little to help those who struggle the most. While the federal government spends \$5 billion in new initiatives to support struggling young readers, it does comparatively little to help struggling adolescent readers (RAND Reading Study Group [RRSG], 2002). While hundreds of sponsored research projects focus on what works best for teaching early reading, few examine what works best with adolescent reading (Partnership for Reading, 2003). And while primary-grade teachers use a number of research-based instructional strategies to support emerging readers, those who teach adolescents know little about how to help the struggling readers in their classrooms (Biancarosa & Snow, 2004).

The effects of this paradox are clear. Eight million U.S. adolescents are considered illiterate (Biancarosa & Snow, 2004). Almost a third of adolescents cannot read at basic levels (National Center for Educational Statistics, [NCES], 2003). Moreover, nearly twice the number of white, economically advantaged students performs above the basic level as their economically disadvantaged peers and this gap is increasing over time (NCES, 2003). In the end, we spend, know, and do little to help our struggling adolescent readers.

Solutions to this first paradox are complicated by a second one: our efforts to help improve reading achievement are rooted in the past instead of the future. New Internet technologies have rapidly become a part of our daily lives (Lebo, 2003) and federal reports acknowledge the reading challenges inherent within Internet text (e.g., NICHD, 2000; RRSB, 2002). Yet, virtually no empirical work has investigated claims that the Internet introduces additional complexities to reading comprehension (Coiro, 2003; Leu, Kinzer, Coiro &

Cammack, 2004). Failing to address this double paradox may lead to even larger gaps in student achievement.

Current Work

As one reviews work in this area, three interrelated themes emerge. First, the Internet has become a central element of academic and economic success. Over 90% of K-12 classrooms now possess Internet technologies (NCES, 2003), and an information economy demands proficiency in their use (Educational Testing Service, 2003; U. S. Department of Commerce, 2002). Consequently, we need to better understand what reading with the Internet entails if we wish to prepare all students for their futures in a world where these skills are so important.

Second, the Internet may require new comprehension skills. As new information and communication technologies continue to emerge (e.g., hypertext, web browsers, search engines and weblogs), they reshape and transform the way we read and write. My previous work has explored this issue. With others, I have developed a theoretical perspective (Coiro, Knobel, Leu, & Lankshear, under contract; Leu, Kinzer, et al, 2004), conducted preliminary research on how students read on the Internet (Coiro & Dobler, 2003; 2004), and described instructional practices teachers can use in their classrooms (e.g., Coiro, 2003, Coiro & Leu, 2003). Much of this work suggests that the skills required to comprehend printed text exist side by side with new and more complex skills required to read on the Internet. Thus, the issue is more complicated than initially thought.

This complexity leads to a third theme suggesting that previous research on traditional comprehension strategies can inform, but not complete, our understanding of online reading. Empirical work has confirmed that proficient readers of printed text actively construct meaning using a small set of powerful reading comprehension strategies (Pressley & Afflerbach, 1995;

RRSG, 2002). Other studies reveal how readers search and locate information within printed text (e.g., Goldman & Rakestraw, 2000; Guthrie & Mosenthal, 1996). Finally, reading scholars have long argued that reader characteristics, especially general knowledge and reading ability, play a central role in reading comprehension (e.g., Alexander & Jetton, 2000; RRSg, 2002),

Unfortunately, little research has conceptualized the use of the Internet as a reading issue. Within the context of a digital divide (Warschauer, 2003), instruction in this area may help schools fulfill their promise and promote greater equity.

Federal guidelines call on educational researchers to pursue rigorous research methodologies (U.S. Department of Education, 2003). The mixed-methods study I propose here extends my previous qualitative work to 1) develop a valid and reliable preliminary measure of online reading comprehension skills; and 2) evaluate whether or not there are new skills and strategies that predict performance on an integrated Internet reading comprehension task.

Theoretical Framework

Three different theoretical perspectives inform this study. The first is that reading comprehension is an active, constructive, meaning-making process (Alexander & Jetton, 2000; NICHD; 2000; RRSg, 2002). Expert readers use a range of strategic processes when comprehending printed text (e.g., Paris, Wasik & Turner, 1991; Pressley & Afflerbach, 1995) and previous research suggests that reader characteristics play a central role in reading comprehension (RRSG, 2002). Among the most important variables are: reading ability, domain knowledge, and experience with a range of texts. Thus, in this study, I will explore how reader characteristics such as these mediate comprehension on the Internet.

The second perspective is that of new literacies (Leu, Kinzer, et al, 2004). While the construct “new literacies” means many things to many people (e.g., Bruce, 2003; Cope &

Kalantzis, 2000; ETS, 2003), this study draws from theoretical work in which we argue the nature of literacy is rapidly changing and transforming as new technologies emerge (Coiro, Knobel, et al, under contract; Lankshear & Knobel, 2004; Leu, Kinzer, et. al, 2004). A new literacies perspective frames reading comprehension on the Internet as a problem-based inquiry process involving four functions including locating information, evaluating information, synthesizing information and communicating information. Each function requires new forms of higher level reading comprehension skills above and beyond those required when printed books.

The final perspective is that of cognitive flexibility (Spiro, Feltovich, Jacobson, and Coulson, 1991). This theory suggests that ill structured contexts such as the Internet require readers to flexibly apply what they know about reading printed text while adapting to new and constantly changing online reading situations. As a result, older ideas used to interpret the meaning of printed text no longer sufficiently explain the knowledge required of readers in web-based contexts. In fact, Spiro (2004) argues, learning strategies that work in simple contexts (e.g., printed books) may be exactly opposite of those best for dealing with complex environments such as the Internet. Thus, it is imperative that we identify which factors contribute to comprehension in online reading contexts.

Guided by these overlapping theories, this study seeks to address three research questions:

- (1) To what extent does a set of reader characteristics that includes general reading ability, prior knowledge, and Internet reading ability predict seventh graders' performance on an integrated online reading comprehension task?
- (2) Does the ability to successfully employ online reading skills significantly predict scores on an online reading comprehension task above and beyond general reading ability and prior knowledge?

- (3) What patterns of strategy use appear to be successful among high and low general ability readers as they complete an integrated online reading comprehension task?

Study Design

This study will be conducted in three phases. First, I will adapt a formative experimental model to refine a new measure of online comprehension skills. Second, I will conduct a hierarchical regression analysis to evaluate the claim that new comprehension skills are required for Internet reading. Third, I will use a contrastive case study approach (Yin, 1989) to analyze patterns of strategy use among four individual cases.

Phase 1: Instrument Development

In the first phase, I will develop an instrument for measuring reading comprehension on the Internet. To do so, I will adapt a formative experimental model (Reinking & Bradley, 2004) – often used to document the development of effective classroom instruction practices – to develop a measure for online comprehension. This phase continues work I’ve already begun to successively refine a valid and reliable instrument.

Sample. Thirty students from three seventh grade classrooms in Connecticut will participate in this phase. Selected students will represent a range of reading ability levels to ensure tasks reflect the greatest amount of variance. I selected seventh-grade readers because expository text comprehension is a vital component of success in middle school (Readance, 2000) and many middle school students are being assigned Internet research tasks (Becker, 1999).

Procedures. I will meet with various pairs of students once a week for approximately three months to refine tasks that assess seventh grade students’ ability to answer questions requiring comprehension skills related to locating, evaluating, synthesizing and communicating

information on the Internet. Since no instruments currently exist, the goal of this phase will be to optimize the discrimination power of test items as a first attempt to measure online reading comprehension. This preliminary Inventory of Internet Reading Skills (IIRS) will enable us to clearly discriminate between students who can and cannot successfully locate, evaluate, synthesize and communicate information using the Internet.

To evaluate the validity of this measure, I will ask both teachers and researchers who study new literacies about the appropriateness of the tasks and items at the beginning, middle, and end of this phase. Once the measure has reached a reasonable level of reliability, I will administer a more formal assessment of split-half reliability with a separate population to achieve a minimum reliability coefficient of .85.

Phase 2 – Collection of Quantitative Data

Sample. For the second phase, 70 students will be asked to complete the Inventory of Internet Reading Skills (IIRS) and another online reading comprehension task. These students will be randomly selected from three urban schools in Connecticut with substantial minority populations. A power analysis suggested this sample size would be appropriate. While students in these schools represent the full range of reading achievement levels, 38% receive free or reduced meals and the per capita income is \$20,443.

Dependent and Predictor Variables. The dependent variable in this study is performance on an integrated online reading comprehension measure that appears to be high in validity among experts in the field (Coiro, 2004). Based on new literacies theory (Leu, Kinzer et al, 2004), this Internet Comprehension Task (ICT) integrates skills required for reading comprehension on the Internet (i.e., locating, evaluating, synthesizing and communicating information) into one performance-based online reading task. I have been piloting and revising this task as well as a

rubric scoring system for the past year and will report on its reliability in Spring, 2005 (Coiro, forthcoming).

Predictor variables will include a set of three reader characteristics:

- (1) *general reading ability* - determined by standardized reading scores on the Connecticut Mastery Test administered in the spring of sixth grade. Reliability coefficients for this test are above .85.
- (2) *prior knowledge* - estimated on a survey adapted from Means & Voss (1996) to measure domain specific knowledge required in the online reading task.
- (3) *Internet reading ability* - estimated by overall performance on the Inventory of Internet Reading Skills (IIRS) developed in Phase 1. This measure will be administered on the computer in an authentic web-based environment.

Any issues of multicollinearity will be resolved prior to analysis (Tabachnick & Fidell, 2001).

Procedures. First, participants will be asked to complete the Inventory of Internet Reading Skills (IIRS). Later, students will complete the measure of prior knowledge and the Internet Comprehension Task (ICT) while thinking a loud. Standardized reading scores will be collected from district records. Sessions will be recorded using Camtasia (<http://www.camtasia.com>) software, which records a digital movie of all activity on the screen and permits audio recording of all think-alouds.

Analysis

Quantitative Analysis. To answer my first two research questions, a sequential multiple regression analysis will be conducted to estimate associations between the predictor and outcome variables. Based on theoretical importance, variables will be entered in the following order: general reading ability, prior knowledge, and Internet reading ability. Correlations and beta-

weights between the relevant coefficients will be calculated to determine the extent to which the set of variables and each independent variable significantly contributes to performance on an online comprehension task. I expect that Internet reading ability will predict performance above and beyond general reading ability and prior knowledge.

Phase 3

Qualitative Analysis. To answer my third research question, think-aloud protocols from four students, two who were successful in completing the task and two who were not, will be selected for further analysis. Using procedures suggested by Pressley & Afflerbach (1995), I will analyze these protocols around declarative (knowing what), procedural (knowing how), and conditional knowledge (knowing when) (Paris, Wasik, & Turner, 1991) to determine strategies readers' use during comprehension. I expect these data to enrich the interpretation of how online comprehension strategies play out qualitatively among adolescent readers. Together, I expect results from both analyses to suggest that new skills and strategies are required to read on the Internet.

Conclusion

Having the skills and strategies to comprehend and respond to information on the Internet will play a central role in our students' success in an information age. This mixed-methods study breaks new ground in an area with virtually no research that links elements of reading comprehension to successful use of the Internet. It seeks to 1) develop a valid and reliable preliminary measure of online reading comprehension skills; and 2) examine the role that new skills and strategies play in online reading success. Results of this study can open new possibilities to build on findings about reading comprehension in traditional contexts, introduce preliminary criteria for measuring online reading comprehension, and guide the development of

research-based instructional practices that bridge the achievement gap among adolescents. Pursuing these possibilities will prompt new focus towards addressing several educational paradoxes we face today.

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