# Measuring the Dispositions of Online Reading Comprehension: A Preliminary Validation Study

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There were two purposes to this preliminary study: 1) to begin the development of an instrument designed to measure the dispositions important for online reading comprehension; and 2) to conduct an initial validation study of this instrument through exploratory factor analysis (EFA). Recent work (Coiro & Dobler, 2007; Henry, 2007; Kuiper & Volman, 2008; Leu, Coiro, Castek, Hartman, Henry, & Reinking, 2008) suggests that online reading comprehension is not isomorphic with offline reading comprehension. This work, however, has been limited to the cognitive skills and strategies of online reading comprehension. The recent Information Literacy Summit in the U.S. (Perrault, 2006) as well as a review of information and communication technology frameworks from nations such as Norway, France, the U. K., and Australia (Bélisle & Rosado, 2007), all indicate the importance of new dispositions that are also necessary to effectively read and learn from online information. As Guthrie, Wigfield, and Perencevich (2004) indicate, affective variables are as important to consider as cognitive variables during reading. Unfortunately, however, we lack valid and reliable methods to measure the affective variables important to online reading comprehension. Instruments such as these would advance research since they would provide us with additional tools to evaluate more completely the consequences of different instructional practices.

## THEORETICAL PERSPECTIVE

An important body of work has begun to analyze the underlying social practices the Internet serves (Castek, 2008; Gee, 2004; Henry, 2007; Hull & Schultz, 2002; Ito, 2001; Kuiper & Volman, 2008; Lankshear & Knobel, 2006; Leander, 2008; New London Group, 1996; Street, 2003). This has helped us to see the Internet not simply as a technology, but as an important new context for literacy. This broad, collaborative approach to theory building is coming to be referred to as New Literacies theory (Coiro, Knobel, Lankshear, & Leu, 2008; International Reading Association, 2009). It takes an open source approach to theory development, at the highest level, inviting everyone who studies the Internet's impact on our literacy lives to contribute to theory development and to benefit from others' contributions. In this breadth, there is an opportunity to benefit from the richness of these different perspectives as we develop richer theory to direct our understanding of Internet use in school settings.

Leu, O'Byrne, Zawilinski, McVerry, and Everett-Cacopardo (2009) describe how new literacies theory functions on two levels: upper case (New Literacies) and lower case (new literacies). *New Literacies*, as the broader, more inclusive concept, benefits from work taking place in the multiple, lower case dimensions of *new literacies*. This is seen as an advantage, not a limitation. It enables the larger theory of New Literacies to keep up with the richness and continuous change that will





always define the Internet. Recently, Coiro, Knobel, Lankshear, and Leu (2008) have identified four common principles that currently define the more inclusive concept of New Literacies:

1. new technologies for information and communication require us to bring new potentials to their effective use;
2. New Literacies are central to full civic, economic, and personal participation in a globalized community;
3. New Literacies are deictic and regularly change;
4. New Literacies are multiple, multimodal, and multifaceted.

Lower case theories explore either a specific area of new literacies, such as the social communicative transactions occurring with text messaging (e.g., Lam, 2006), or a focused disciplinary base, such as the semiotics of multimodality in online media (e.g., Kress, 2003). Each body of work contributes to the larger, continually changing, theory of New Literacies.

Within the broad definition of New Literacies theory, we frame the development of this instrument within the more specific theory emerging around the new literacies of online reading comprehension (Leu, Kinzer, Coiro, & Cammack, 2004; Leu, O'Byrne, Zawilinski, McVerry, & Everett-Cocapardo, 2009). This perspective defines online reading comprehension as a process, which includes:

> "…the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other ICT to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others." (Leu, Kinzer, et al., 2004, p.1570)

Consistent with work by Afflerbach, Pearson, and Paris (2008), online reading comprehension *skills* are defined as automatic actions that do not require conscious awareness while they are employed to support the comprehension process; online reading comprehension *strategies* are defined as deliberate goal directed actions undertaken with awareness and control that support comprehension. While we are beginning to understand the skills and strategies necessary for effective online reading comprehension (Coiro, 2007; Coiro & Dobler, 2007; Leu, O'Byrne, et. al, 2009), we have little understanding of the dispositions, or attitudes and beliefs, required while reading online.

### *What are Dispositions?*

According to Claxton (1999), learning takes capabilities, but capabilities are not sufficient enough for all learning to occur, especially in academic settings. Learning also takes specific dispositions, or affective variables, which according to Katz (1988, p. 30) is a "domain of human attributes not attributed to knowledge, skill, or behavior."

Furthermore Carr and Claxton (2002, p. 13) "define a disposition as a tendency to edit, select, adapt, and respond to the environment in a recurrent, characteristic kind of way." Basically, a learning disposition is a pattern of behaviors, situated in the context of the environment, that when recognized and developed by those who can manipulate the environment, may lead to gains in the

acquisition of knowledge, skills, and understandings. Thus while online reading comprehension involves specific skills and strategies there are also likely to be affective factors that determine how these skills and strategies are used.

Recent theories of reading comprehension (Alexander & Jetton, 2002; RAND Reading Study Group, 2002) suggest that learning involves a number of affective variables (Baker & Wigfield, 1999; Guthrie & Wigfield, 1997) and motivational factors (Zimmerman & Bandura, 1994) that go beyond skills. Furthermore, recent work (Coiro, 2007; Liaw, 2002; Lin & Tsai, 2005) has suggested that these affective variables play an even greater role in reading informational text, and also grow in complexity during online reading comprehension. It is therefore critical to understand the dispositions necessary for online reading comprehension. We define dispositions as the attitudes and beliefs, or "habits of the mind" (Katz, 1988, p. 30) that lead to patterns of behavior (Carr, 1999; Claxton, 1999; Carr & Claxton, 2002) that promote gains in the acquisition of knowledge, skills, and understandings (Ennis, 1987).

*Dispositions in Offline Text, Hypertext, and on the Internet*

Research has suggested that the dispositions needed to read and comprehend are influenced by the nature of the text (Baker & Wigfield, 1999; Rand Reading Study Group, 2002). For example, motivational factors that have been identified when reading offline informational text include: curiosity, intrinsic value, and self-efficacy (Guthrie, Van Meter, McCann, Wigfield, Bennett, Poundstone, Rice, Fabisch, Hunt, & Mitchell, 1996). Reading non-linear hypertext, within a limited information space, may require many of these same dispositions, but these may also become more complex and new dispositions may be needed (Coiro, 2007). For instance, affective variables such as flexibility, versatility, high-self efficacy, learning style, and motivation appear to play a role in meaning making during hypertext interactions (Anderson, 2001). The Internet, however, is a much more complexly structured information space (Norris, 2001; Katz & Rice, 2002). Moreover, it is essentially unlimited in nature (Alvermann, 2004; Gross, 2004) and reading on the Internet is dependent on the reader's choices and actions since readers physically construct the texts that they read through the links that they follow (Leu, Coiro, et al., 2008). Thus, dispositions may become even more profoundly complex and even newer dispositions may be essential during online reading comprehension. In order to understand the nature and role of dispositions during online reading comprehension, we require ways to evaluate them. This study initiates the development of instrumentation that may permit us to more fully understand the role of dispositions during online reading comprehension.

## METHOD

The development and validation of the instrument, Disposition of Online Reading Comprehension (DORC), went through three steps. First a set of hypothesized dispositions likely to be important for online reading comprehension was identified. Second, items were created and tested through content validation by experts. Finally, an exploratory factor analysis was used to understand the underlying relationships of the items and constructs (Thompson, 2004) and a reliability analysis was conducted to estimate the consistency of the items to their constructs.



*Step One: Identifying Dispositions*

Five dispositions were chosen from three sources: 1) a review of the literature; 2) preliminary results of verbal protocol analysis of seventh-grade students reading online (Zawilinski, Carter, O'Byrne, McVerry, Nierlich, Leu, 2007); and 3) classroom observations that took place during a study investigating the development of an Internet Reciprocal Teaching model (Leu & Reinking, 2005). These included: persistence, flexibility, collaboration, reflection, and critical stance. Since positive dispositions can lead to effective learning (Carr & Claxton, 2002; Coiro, 2008; Guthrie, Wigfield, & Perencevich, 2004) it was thought that these five dispositions were likely to affect online reading comprehension.

Persistence refers to the firm continuance in a course of action during online reading, despite ongoing difficulty. Online reading is often challenging (Eagleton & Dobler, 2007). It requires rapid, ongoing decision-making, evaluation of those decisions, and frequent revisions to initial decisions about what and where to read as readers locate, evaluate, synthesize and communicate information (Coiro & Dobler, 2007). Students may give up when they do not find the information they seek.

Flexibility refers to the learner being able to transfer skills to novel situations and to apply new approaches when the initial approach is unsuccessful. When reading online, students require diverse ways of thinking about conceptual and procedural knowledge (Lawless & Schraeder, 2008).

Collaboration refers to students being able to work together in online environments to problem solve. While offline comprehension has long been operationalized as an individual task it is becoming evident that learning in the 21st century requires greater collaboration among students (American Association of School Librarians, 2007; Partnership for 21st Century Skills, 2005).

Reflection refers to thinking about how you think, and continually looking for more effective and efficient ways to expand these abilities. Online reading comprehension requires continual reflection, while students monitor and evaluate how they locate, evaluate, synthesize and communicate information (Coiro, 2007).

Finally, critical stance was defined as having a healthy skepticism of the information the student is considering. Evaluation of online texts also requires this critical eye (Fitzgerald, 1999). There are many challenges students face when using the Internet because the texts are not vetted, are multimodal, are subject to manipulation, and can be authored by anyone (Tate & Alexander, 1996).

*Step Two: Content Validation*

In order to establish item validity, the instrument went through three separate stages of content validation. The content validation process involved the use of experts who assisted in the definition of constructs and the validation of items through both qualitative and quantitative methods (McKenzie, Wood, Kotecki, Clark, & Brey, 1999).

*Stage one.* The participants for the first stage of content validity included six professors of literacy and technology, four doctoral students involved in new literacies research, and 10 school educators (one principal of a middle school, five high school literacy teachers, and four middle school literacy teachers familiar with online reading comprehension). Of the 20 invitations sent out, data was collected from seven experts and four educators.

The participants were sent a survey containing a set of items that conceptualized the five dimensions in the survey: critical stance, reflection, flexibility, collaboration, and flexibility. They were also given theoretical definitions for each of the constructs in Table 1.

**Table 1**. Theoretical Definitions for Content Validity

| Construct | Definition |
|---|---|
| Critical Stance | Having a healthy skepticism to what you read. |
| Reflection | Thinking abut how you think and what you learn |
| Persistence | Not giving up when faced with ongoing difficulty. |
| Flexibility | Continually looking for more effective and efficient ways |
| Collaboration | Being able to work well with others in groups |

Ten to 15 items were developed to reflect each theoretical construct. Using the definitions provided, the experts rated the dimensionality of each item by deciding which construct the item measured. As suggested by Gable and Wolfe (1993) any item identified by 90% of participants as measuring the hypothesized construct was kept for further analysis.

Next, participants were asked to rate how sure they felt about their choice of dimensions. They could choose *very sure* (3), *pretty sure* (2), or *not sure* (1). This response was used to calculate the content validity rating for each item (McKenzie et al., 1999). A mean score was calculated from all participants who correctly labeled the item. Items that had a content validity rating of 2.6 were kept for the final instrument.

Then, the respondents were asked to rank how relevant they thought each item was for the dispositions they chose. Respondents could choose: *completely relevant* (4), *very relevant* (3), *somewhat relevant* (2), *not relevant* (1). These scores were used to calculate a content validity index (CVI) (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). To calculate the CVI, the sum of respondents who correctly identified the construct and answered that they felt the item was highly relevant or relevant was divided by the total number of respondents who correctly identified the item. To be included in the instrument, the CVI for each item had to be greater than .70 (Rubio et al., 2003).

Finally the respondents were encouraged to provide written feedback. The participants were not given structured questions. Instead, feedback was solicited with a comment or suggestion or box. The qualitative data was used to see if the definitions of constructs were adequate (McKenzie et al., 1999).

The findings from the first stage of content validity showed that not all of the experts agreed upon which items related to which constructs. Both the quantitative and qualitative data suggested that many items were multidimensional and the construct definitions were inadequate. Because of the lack of agreement another round of validation was needed for several reasons. First, respondents felt that many of our items measured specific skills and not attitudes and beliefs. Second, there was disagreement over the definition of flexibility. Many participants seemed to use a definition rooted in cognitive flexibility theory (e.g., Spiro, Coulson, Feltovich & Anderson, 1988) while others used a definition based on the ability to transfer skills to new contexts (e.g., Campione, Shapiro,



& Brown, 1995). Finally, the lack of a "none of the above" choice in the validation instrument was problematic.

*Stage two.* The participants in the second round of content validation included four professors studying the Internet and reading comprehension and seven doctoral students in literacy education. The same methods were used for content validation except unacceptable items were deleted, definitions of constructs were refined, and new items were added. In the second round of validation the percentage of agreement in regard to construct and item agreement had to be greater than 90%, the CVI greater than 0.70, and the validity rating greater than 90%. A higher threshold was used in order to increase the content validity of items.

The results from the second round of content validation lead to the inclusion of 11 items out of an initial 56 items that were drafted. Several items, which had been acceptable in the first round of content validity, were now found to be inadequate due to redefining the nomological net concerning the hypothesized constructs and the higher thresholds. Specifically, none of the items for reflection met acceptable levels of validity ratings.

*Stage three.* A third round of content validation was used, using an expert panel and focus group methods (McKenzie et al., 1999). Participants included two doctoral students and three professors studying literacy and the Internet. This group developed the final list of items (See Appendix B) using the results from both rounds of content validity. As suggested by McKenzie et al. (1999), the expert panel first looked at the qualitative comments about construct definitions. They then compared items from the previous rounds of content validation.

An effort was made to focus revisions on target words. For example the word "think" was used in most items designed to load on reflection and the word "try" was used an items hypothesized to load on persistence. In addition, switching ideas or direction was often used for flexibility statements, while enjoying working with others was often used for collaboration statements. All items in the final survey meet the standards that had been established previously: construct and item agreement greater than 90%, a CVI greater than 0.70, and a validity rating greater than 90%.

*Step Three: Exploratory Factor Analysis*

The purpose of the Exploratory Factor Analysis (EFA) was to summarize the data set provided by the items into a smaller set of factors (Comrey & Lee, 1992; Pett, Lackey & Sullivan, 2003). The EFA was appropriate for this study since it was important to determine if the factors uncovered by the analysis corresponded with the hypothesized dimensions of the instrument.

*Participants.* The DORC instrument was administered to a convenience sample as a part of a larger group of assessments given to seventh and eighth grade students in a New England state (n=1,276) all whom participated in a statewide one-to-one laptop initiative. This population was especially appropriate since each student regularly used a laptop and the Internet in school on a regular basis. All teachers in the state were invited to have their students participate in the assessment package. As an incentive, teachers were promised descriptive results for all of the assessments in which their students participated.

*Choosing Factors for Extraction.* Principal axis factor analysis was selected because it would allow for measurement error in subjects' responses (Osbourne & Costello, 2005). Initial analysis extracted six factors with eigenvalues greater than one. Analysis of the scree plot suggested the extraction of five factors from the data set. Due to the lack of agreement on the number of factors to extract, the

researchers decided to also run a Parallel Analysis (O'Connor, 2000). The Parallel Analysis suggested the extraction of five variables. Thus, the decision was made to extract five factors from the data set using principal axis factoring and an oblimin rotation. An oblique rotation was chosen because it was hypothesized that the latent variables would be correlated. When there is high correlation between latent variables oblique rotations produce better estimates of the true factors (Fabrigar, Wegener, Macallum, & Strahan, 1999).

*Reliability.* While there are many different types of reliability, this term is generally used to represent the extent to which measurements are consistent. Any valid measure must be reliable. Since scales were being developed, we sought an indication of internal consistency, which measures the degrees of relatedness of items. Cronbach's coefficient alpha was calculated (Pett et al., 2003), which represents the total proportion in a given scale that can be attributed to a common source. The calculation of this coefficient alpha requires several assumptions to be met: 1) the items are independent; 2) the errors are uncorrelated; 3) the items are positively correlated; and 4) the items are unidimensional. To test these assumptions the initial factor analysis was examined to determine which items had positive inter-item correlations. The inter-item correlations matrix was examined, and any items that were redundant or too positively correlated with each other were deleted. Any items that were strongly negatively correlated with each other also were deleted. The researchers also checked to see if the correlations between items were similar and the variances small. This ensured that the items were independent. Furthermore, the items were also systematically reviewed by looking for multidimensionality, meaning that the items loaded at least moderately on more than one scale. These multidimensional items were then deleted from the analysis.

**Table 2**. Five Factor Exploratory Factor Analysis for the DORC

| Item | RT | CS | CO | FL | PE |
|---|---|---|---|---|---|
| RT1 | 0.447 | | | | |
| RT2 | 0.481 | | | | |
| RT3 | 0.589 | | | | |
| RT4 | 0.579 | | | | |
| RT5 | 0.531 | | | | |
| RT6 | 0.531 | | | | |
| RT7 | 0.596 | | | | |
| RT8 | 0.534 | | | | |
| RT9 | 0.613 | | | | |
| RT10 | 0.575 | | | | |
| RT11 | 0.576 | | | | |
| RT12 | 0.739 | | | | |
| RT13 | 0.654 | | | | |
| RT14 | 0.721 | | | | |
| CS1 | | 0.737 | | | |
| CS2 | | 0.558 | | | |
| CS3 | | 0.573 | | | |
| CS4 | | 0.472 | | | |
| CO1 | | | -0.761 | | |
| CO2 | | | -0.931 | | |
| CO3 | | | -0.506 | | |
| FL1 | | | | 0.484 | |
| FL2 | | | | 0.617 | |
| FL3 | | | | 0.537 | |
| FL4 | | | | 0.420 | |
| PE1 | | | | | -0.533 |
| PE2 | | | | | -0.525 |

*Note.* RT = Reflective Thinking, CS = Critical Stance, CO = Collaboration, FL = Flexibility, PE = Persistence



## RESULTS

The EFA, using principal axis factoring and an oblimin rotation, gave a "marvelous" (Kaiser, 1974, p.35) Kaiser-Meyer-Olkin test value of 0.939, and showed that five factors explained 38.68% of the variance in the model. The pattern matrix (>.40) showed the items loading on all five factors. (See Table 2.)

**Table 3**. DORC Factor Correlations

| Reflective Thinking | Critical Stance | Collaboration | Flexibility | Persistence |
|---|---|---|---|---|
| Persistence | -0.395 | -0.66 | 0.189 | -0.272 |
| Flexibility | 0.511 | 0.147 | - 0.438 | |
| Collaboration | -0.399 | -0.259 | | |
| Critical Stance | 0.038 | | | |
| Reflective Thinking | | | | |

*Note.* Cronbach's alpha reliability estimate provided.

Factor one was labeled "reflective thinking," with 14 items (Items RT1–RT14) loading on this scale. Items that loaded on this scale included: all items hypothesized to load on reflection (RT5–RT14); three items that were hypothesized to load on persistence (RT2, RT3, RT4); and one item hypothesized to load on the flexibility scale (RT1). Looking at the Inter-item Correlations Matrix for all items, there were no negatively, or highly correlated items. (See Table 4.) In order to measure internal consistency a coefficient alpha was calculated ($\alpha$ = 0.907) Overall, the 14 items loaded squarely on the reflective thinking construct, suggesting that these should be retained in future iterations of the DORC.

Factor two was labeled "critical stance," with four items (Items CS1–CS4) loading on this scale. The items that loaded included four of the six items hypothesized to measure critical stance (Items CS1–CS4). Looking at inter-item correlations, the four items were correlated to each other, with the one exception being CS4. The coefficient alpha of 0.686 did not quite reach the acceptability level of 0.7 (Nunnally, 1978). Thus post-hoc tests were conducted to understand what would be necessary to improve internal consistency. The item-total statistics matrix showed the coefficient $\alpha$ going down if any of the four items were to be deleted. More items appear to be required for this factor in a final version of the instrument. The Desired Cronbach's Alpha Formula (Kline, 2005) suggested an additional four to five items need to be added to this factor in order to achieve an observed $\alpha$ of 0.7.

Factor three was labeled "collaboration," with three items loading on this scale. The items that loaded included three of the six items hypothesized to measure collaboration (Items CO1, CO2, CO3). Looking at the Inter-item Correlation matrix, items CO1 and CO2 correlated highly with each other, while item CO3 was correlated at an average level with the other two. The three items together achieved a Cronbach's Alpha of 0.754, which is acceptable for this level of research (Nunnally, 1978). The observed $\alpha$ would rise to 0.787 if item CO3 were deleted.

**Table 4**. Reliability Statistics

| Scale | # of items | Reliability |
|---|---|---|
| Reflective Thinking | 14 | 0.907 |
| Critical Stance | 4 | 0.686 |
| Collaboration | 3 | 0.754 |
| Flexibility | 4 | 0.623 |
| Persistence | 2 | 0.700 |

Factor four was labeled "flexibility", with four items loading on this scale. The items that loaded included four of the six items hypothesized to measure flexibility (Items FL1–FL4). These four items were minimally correlated with each other. The four items together generated a Cronbach's Alpha of 0.623, below the acceptability level of 0.7 (Nunnally, 1978). According to the item-total statistics matrix, the achieved Cronbach's Alpha would decrease substantially if any of the items were deleted. Thus new items must be added in a confirmatory factor analysis. According to the Desired Cronbach's Alpha formula (Kline, 2005) five to six items would need to be added to this factor to raise the observed Cronbach's Alpha to an acceptable value of 0.70 (Nunnally, 1978).

Factor five was labeled persistence. Two items loaded on this factor with a standard deviation .909. The items that loaded on the factor included two items hypothesized to measure persistence (Items PE1 & PE2). The two items were moderately correlated with each other. The two items together achieved an acceptable Cronbach's Alpha of 0.70.

## DISCUSSION

It is important for research to begin to identify, measure, and study the development of dispositions important for successful online reading comprehension, especially with the increasing importance of reading online information in schools and society. Carr and Claxton (2002) suggest learning is an interaction of capabilities and dispositions. Studies are emerging that investigate the capabilities of students while reading online (e.g. Coiro, 2007; Castek, 2008; Henry, 2007), but little is known of the specific dispositions that strengthen these skills. This study attempted to validate a tool, the DORC instrument, which was designed to measure the dispositions specific to online reading comprehension.

The content validity of this instrument was established through three stages of expert evaluation. Item construct validity for all of the scales was established through an EFA. This factor analysis explained 38% of the variance in the model. The reliability of three of the five factors was shown to be more than adequate for research purposes. Two of the factors approached acceptability levels and we calculated estimates for the number of additional items that will be required for each. Even though the validation levels achieved so far in the testing of the DORC are positive, much more validation and work needs to be done in future iterations of the instrument to fully understand the forces at play while individuals read online.

The EFA generally followed the predicted model, with each of the five predicted factors being represented: reflective thinking, critical stance, collaboration, flexibility, and persistence. The one exception appeared to be the factor "reflective thinking." This factor was much richer and more complex than expected. It included three items from the reflection scale, three items from the persistence scale, and one item from the flexibility scale. This suggests that reflective thinking during online reading comprehension includes a rich and complex mixture of elements: monitoring, reflection, persistence, and flexibility.

While there is no doubt that future work is important to conduct, the initial results obtained in this study are very promising. They suggest an important direction and model for future work. That work should seek to extend and expand upon this preliminary study in order to increase the overall variance accounted for by the model beyond the 39% we found with these items. New items



should be considered, based on these results. They should be piloted and included in an expanded instrument, in an attempt to develop one with additional sensitivity.

Further validity studies of the DORC would be enhanced by conducting confirmatory factor analysis. (CFA). The CFA would allow the researchers to understand the loadings for each of the items and determine the best possible scenarios for modifying future iterations of the instrument (Thompson, 2004). Additional items appear necessary on the collaboration and flexibility scales. These will need to be developed and tested using similar methods for establishing construct validity, conducting factory analysis, and testing internal consistency. They appear necessary to strengthen the validity and reliability of the instrument, while also explaining additional variance in the model. A CFA, along with full analysis of the loadings of all items will be used to revise terminology of items that do not load strongly, and draft new items to strengthen weaker loading on scales.

In planning for and revising future iterations of the DORC, we will also investigate other dispositions that may factor into online reading comprehension. The initial hypothesized factors included: collaboration, persistence, flexibility, reflection and critical stance. This list may not be exhaustive and other dispositions may influence meaning making while reading online. For example, in both teacher determined and student determined tasks creativity or curiosity may affect reading comprehension. Further testing of the DORC can include additional dispositions, which can be identified through a review of the literature or by testing the correlation of other measures of dispositions (Coiro, 2008) and measures of online reading comprehension.

Additional studies should also be conducted to test the predictive validity of the instrument, especially by examining this relationship between the DORC and measures of online reading comprehension. Having a valid and reliable instrument to measure online reading dispositions would also to help us understand, in a richer sense, the complex set of factors associated with online reading comprehension during instructional studies.

One important limitation of this study was the use of a convenience sample from a single state. This may threaten the generalizability of the results to larger samples that are more representative of the population and students who are less familiar with online reading of information on the Internet. We tend to think of adolescents as "digital natives," highly skilled in all types of online experiences. They are not. Work by Bennett, Maton, and Kervin (2008) indicates that adolescents are remarkably unskilled with the use of online information, though they may be very sophisticated with texting, social networking, video downloads, and MP3 downloads. The convenience sample we used may be more skilled and knowledgeable than most about online information and online reading comprehension since they have all had individual laptops and used them each day in school settings for information and classroom learning activities. Thus, generalizability issues are an important concern. Others, in other locations, may not match the skills, and the dispositions, of these students. In a certain sense, though, this limitation may be an advantage. The patterns found in this study may match more closely student dispositions in future years, when more classrooms more regularly integrate online reading comprehension of information during school.

There is also debate as to the best method for measuring dispositions (Allal, 2002). Some suggest that assessment methods such as questionnaires and interviews may not afford the accurate expression of dispositions (Claxton & Carr, 2004) because they do not provide a sufficiently rich context for their measurement. Others argue that dispositions need to be situated in specific contexts

to allow for adequate evaluation (Sadler, 2002). Both are important perspectives to consider but each presents certain problems with accurate and reliable means for their evaluation. Perhaps the best solution may be to combine self-report instruments such as the DORC in conjunction with other methods such as classroom observations, which allow dispositions to also be measured while the learner is given an activity or a premise within which to work. We suspect that a combination of approaches such as this will permit the richest, most complex, and most accurate measurement of the dispositions of online reading comprehension. We hope the work presented here will be a first step in that direction.

## AUTHOR'S NOTE:

The authors would like to thank Dr. David Silvernail at the University of Southern Maine for his gracious assistance.

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## APPENDIX A

**Table 5**. Items for the DORC

| Item | Item Terminology |
|---|---|
| **RT1** | When one strategy does not work to find information on the Internet I pick another and keep trying. |
| **RT2** | I am always learning new things when using the Internet. |
| **RT3** | When I get stuck looking for something online, I am willing to try new things. |
| **RT4** | I try hard when using the Internet to learn new things. |
| **RT5** | I am ready to learn new things on the Internet even when they are hard. |
| **RT6** | When searching online gets tough, I am willing to spend extra time. |
| **RT7** | I think about the words I choose when I write an email or comment. |
| **RT8** | It is important to keep your goal in mind when reading online. |
| **RT9** | I think about how I am reading when I visit websites. |
| **RT10** | I think about my opinion of a subject when reading websites. |
| **RT11** | When I choose a website to read, I think back to what I already know. |
| **RT12** | I think about what I am doing as I use the Internet. |
| **RT13** | I make a plan before I use the Internet for homework. |
| **RT14** | I ask myself if I am finding what I am looking for on the Internet. |
| **CS1** | I trust what I read on the Internet. |
| **CS2** | Authors tell the truth when writing on the Internet. |
| **CS3** | I trust the opinions I read on websites. |
| **CS4** | You can trust the pictures on websites. |
| **CO1** | I like doing projects with other people when using the Internet. |
| **CO2** | I enjoy working with classmates when using the Internet. |
| **CO3** | I can work with a partner to solve problems online. |
| **FL1** | Solving problems using the Internet often takes strategies I learned somewhere else. |
| **FL2** | Using the Internet requires me to make quick changes in how I read. |
| **FL3** | When searching online, I often have to change the strategies I have used in the past. |
| **FL4** | When reading the Internet you have to look at information by moving between different viewpoints. |
| **PE1** | I keep trying when I cannot find what I am looking for on the Internet. |
| **PE2** | When I make a mistake when using the Internet, I keep trying until I get it right. |