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### Reading on the internet: The Presentation of online news articles and its relationship to reader's recall and comprehension

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The Rochester Institute of Technology

Department of Communication

College of Liberal Arts

Reading on the Internet: The Presentation of Online News Articles  
and Its Relationship to Reader's Recall and Comprehension

by

Kristen Curtze

*A Thesis submitted*

in partial fulfillment of the Master of Science degree  
in Communication & Media Technologies

Degree Awarded:

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**Reading on the Internet: The Presentation of Online News Articles and  
Its Relationship to Reader's Recall and Comprehension**

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College: Liberal Arts

Degree: Master of Science in Communication and Media Technologies

Term Degree Awarded: Winter (20102)

**Abstract**

Since 1995, the number of Internet users has increased by 1.88 billion people. As the population increased, so did the number of websites, news portals, and the amount of information presented on the Internet. Information once commonly read in a newspaper can now be found online with videos, interactive features, and other forms of multimedia. Yet, is reading a story in static, plain text different from reading a story with videos and interactivity? This study asks whether or not a relationship exists between Internet news article presentations and a reader's recall and comprehension. Forty-two participants read online news articles presented in both multimedia and plain text formats before a test. The results are discussed and analyzed for future consideration.

Keywords: news, online, reading, recall, comprehension

### **Reading on the Internet: The Presentation of Online News Articles and Its Relationship to Reader's Recall and Comprehension**

Since December 1995, the number of worldwide Internet users jumped from 16 million to about 1.9 billion (Internet World Stats, 2009). As the Internet became more popular, website developers began to create new websites to host extensive collections of news articles. In the late 1990s, the Internet was upgraded from Web 1.0 to Web 2.0 to accommodate new search engines, web blogs, and increased interactivity. What once might have been a website with simple text and information became a fast-paced and fully interactive portal stocked with videos, user comments, sounds, links, and games. Websites began to feature relatively concise text-based pages to avoid overwhelming the user. News websites such as CNN.com began to include “story highlights” and related videos next to the full-length articles to permit readers to gain a quick understanding of an article without a thorough reading. More recently, developers have adopted the design of adding limitations to user input, an example being Twitter with a 140 character limit per post. Due to such trends in website formatting and layout, Internet users are often exposed to numerous summarized articles, word-limited content, and multimedia-based interfaces. The change from static text layouts to the current, interactive website styles prompted various studies that focused on the impact of Internet reading upon user comprehension and memory – Dyson and Haselgrove's (2000) comprehension study based on the effects of a reader's pace on reading comprehension or Johnson, Edwards, and Kues' (2003) study of user recall based on the format of news information.

Dyson and Haselgrove (2000) focused on the changes in reading comprehension when Internet users read on-screen text at different speeds. The users read at both normal and faster

reading speeds and the results indicated an overall decline in the level of comprehension during the faster read. Since websites are more often designed for faster viewings or scanability, Dyson and Haselgrove's research indicates that many Internet users are likely to experience a change in reading comprehension.

Johnson, Edwards, and Kues (2003) questioned the efficiency of Internet reading by asking, "Does the presentation of editorial content in multimedia format help readers understand and remember more story information?" Their study involved comparing the recall test results of participants who read both a text-based and multimedia-based version of an Internet news article. The results indicated that the details of one article were better recalled in multimedia-based formats versus the text-based formats. Such findings demonstrate the potential decrease in user recall should the information be presented in an improper format, which may concern website editors, companies on the Internet, and even teachers interested in online, interactive teaching programs.

The growing trend in Internet layout and design is to increase multimedia, interactivity and the speed of the experience. Until a study indicates a predominately negative effect, users will likely continue to adapt in some way to the new format of information. The central focus of this study will be to identify whether or not a difference exists between user recall and reading comprehension and the presentation of news content in a website format.

### **Research Questions**

- R1: How does the presentation of news content in a website format affect a reader's recall and comprehension of story information?
- R2: What differences in user recall and reading comprehension exist between reading plain-text news articles and interactive, web-based news articles?



### **Rationale**

Interest in studying the impact of the Internet on user reading comprehension stemmed from three interrelated reasons:

As a website developer and a frequent Internet user, I feel compelled to understand whether the changes in Internet content layouts have any impact on my own reading comprehension. Heavy Internet users, like myself, will likely avoid the lengthy, static newspaper and instead go online and scan the multimedia version of the articles in seconds. Perhaps the new, quick formats are beneficial to expanding mental capacity or multi-tasking capabilities. Alternatively, the changes could also bring forth a time in which sound information is traded for easily accessible fluff and fast readability. This study will help indicate if any effect is present among various Internet users.

Second, the Internet is constantly evolving to accommodate increased number of users, an array of ideas, and new forms of information and entertainment such as Facebook, Hulu, or Twitter. Research should match the pace in order to identify whether such changes are relatively beneficial or disadvantageous. Website developers could benefit from such research should results indicate a positive or negative effect and therefore use the information to help build an efficient and successful website. Collectively, the Internet would successfully evolve into a more beneficial tool or experience for users should all developers choose to consider the research. Past studies have indicated that certain variables such as browser window size, text layout, and sentence length can impact user reading comprehension just as much as the content quality. Thus, high Internet users may have adapted to such variables by altering their Internet behavior and means of comprehension. Research should identify the impact of adapting to such Internet

trends and whether or not high Internet users are sacrificing or increasing mental capacity.

Finally, the prospect of using online resources for educational or exposure purposes could have a negative effect on individuals attempting to efficiently learn material. More specifically, the increased use of online resources in the classroom may pose a threat to students learning material depending on the website formatting or layout. Teachers need to be aware of the impact such website layouts have on student comprehension and memory. If particular information is presented in a disadvantageous website format, the learning experience will likely decrease in quality. The results of this research may help individuals understand which formats should be considered to produce a more quality reading experience and ultimately ensure a successful learning experience for any Internet user.

### **Literature Review**

While the Internet continues to evolve and incorporate new, innovative ideas, researchers are trying to keep the pace in order to understand the impact of each change on Internet user experience and comprehension. Uncommon content layouts, streaming videos, animations with sound, variety of colors, instant messaging features, and auto-refresh programming are all examples of recent developments that are capable of impacting user reading comprehension. The multitude of research surrounding Internet reading comprehension and recall has identified such variables thus the studies can be placed into the following four categories: interactivity, literacy, reading comprehension strategies, and behavior changes.

#### **Interactivity**

Website interactivity is an important component of website development and often aids in improving user satisfaction as well as comprehension. Ritterband, Cox, Gordon, Borowitz,

Kovatchev, and Walker (2006) sought to determine how to best develop Internet applications to obtain positive outcomes such as improve comprehension. The group conducted several small studies to identify whether three Internet components – audio, graphics, and interactivity – should be incorporated into modules of an Internet intervention application for children with pediatric encopresis, the repeated voluntary or involuntary passage of quantitative normal feces into inappropriate places after the age of 4 years. Forty-nine children and their parents presenting to a pediatric gastroenterology clinic for treatment of encopresis participated (Ritterband et al., 2006). The participants were shown modules of an encopresis Internet intervention both with and without the three Internet components to examine pre to post changes in knowledge, motivation, and readiness to change (Ritterband et al., 2006). The results generally indicated that knowledge, motivation, and readiness to change improved when using the interactive module. More specifically, children showed a trend for knowledge improvements using the interactive module but not with the noninteractive module. The parents, however, showed significant improvements using the noninteractive modules but not the interactive modules (Ritterband et al., 2006). Such findings indicate that though interactivity can improve comprehension and recall for some Internet users, others may not equally benefit from the same components of interactivity. Therefore, website editors and developers need to understand the impact of any interactive features upon the user comprehension.

Given the popularity of interactive, multimedia-based websites, Johnson, Edwards, and Kues (2003) asked, “Does the presentation of editorial content in multimedia format help readers understand and remember more story information?” Their study involved exposing readers to an identical story presented in two distinct styles – plain text and multimedia format. Of the 46

participants, half were instructed to read one story in plain text and different story in a multimedia format. The other half was instructed to do the same except the respective stories were in opposing formats. The results indicated a slight, marginally significant difference in how test subjects correctly recalled story information that was presented in text vs. using multimedia. When asked to recall information about names and places, participants who received information in text were more likely to answer questions correctly while participants who received the multimedia-based story were more likely to recall unknown processes, procedures, or terminology (Johnson et al., 2003). The study shows that increased interactivity and multimedia can effect how a user recalls the information, but may be beneficial in a few, particular instances such as product demonstration or explaining new procedures. Ultimately web developers and content managers must carefully select how certain information is presented to the users to prevent confusion or distraction.

### **Literacy**

In 2000, researchers Kramarski and Feldman examined the contribution of an internet environment embedded with metacognitive, thinking about thinking, instruction on students' reading comprehension, motivation and metacognitive awareness. The study involved 52 eighth-grade students placed in one of two conditions: an internet group – exposed to metacognitive instruction embedded in an internet classroom; and a control group – exposed to metacognitive instruction embedded in a regular class. Results indicated that though the Internet environment contributed to motivation towards learning, no real contribution was found regarding actual improvement of reading comprehension and metacognitive awareness (Kramarski & Feldman, 2000). Despite the findings, incorporating the Internet in the classroom is still a popular teaching

strategy. Educational application developers may have considered new ways of teaching and engaging students but such techniques may require a certain level of Web literacy or reading comprehension.

According to Coiro (2003), “Today, the definition of literacy has expanded from traditional notions of reading and writing to include the ability to learn, comprehend, and interact with technology in a meaningful way” (Coiro, 2003, p. 458). Learning, comprehending, and interacting with technologies such as a computer or the internet may not be easy for everyone. “Electronic texts introduce new supports as well as new challenges that can have a great impact on an individual's ability to comprehend what he or she reads” (Coiro, 2003, p. 458). While some of the interactive features like videos and audio can help engage some Internet readers, some competent readers of conventional text may become cognitively overloaded and emotionally frustrated by such features. “Hypertext and interactive features can offer too many choices and too many animations that may distract and disorient otherwise strong readers” (Coiro, 2003, pg. 462). Yet, teachers often turn to technology application to interest and engage students in challenging learning experiences. Despite being a sensible alternative to reading a textbook aloud, the effects of such technologies and applications are not heavily researched or understood thus could potentially lead to problems in the future.

Coiro seems to firmly believe that the concept of 'literacy' is evolving to accommodate the new reading formats, but how will the changes affect the reading comprehension strategies used world-wide in classrooms and learning environments?

### **Reading Comprehension Strategies**

Many researchers have focused their studies on not only the basic reading comprehension

strategies and tools, but how the Internet has impacted the traditional learning styles. The vast proliferation and improvement of informational and communicational technologies brought forth new learning environments and teaching strategies in education. More specifically, the Internet, being a combination of many of the former technologies, provides audio, text, and visual materials simultaneously while allowing the user to plan his or her own learning process. Instead of reading a page of a book from left to right, an Internet user can watch a video, read a summary of an article, view pictures, or discuss the content with other online readers. In such context, the Internet and added interactivity seem like a great improvement for the world of education. Yet, can freedom from structured or traditional reading comprehension strategies have a negative impact on students or anyone using the Internet for learning purposes?

In 2010, Kartal and Arikan questioned if the shortened language found within blogs, wikis, or video-sharing websites on the Internet had a negative effect on users. He investigated the reading habits of foreign languages teacher trainees and found results supporting this concept. According to Kartal and Arikan, the subjects stated that they “avoided reading novels because of both the differences between today's language and the language of literary works, and the abundance of pages” (Kartal & Arikan, 2008, pg. 95). Kartal and Arikan add that “the problem is reinforced and generalized ever day with the multiple-choice questions that are used in ever field of the educational system. In addition, although students live in a world full of media images, it has shown that they do not possess the necessary skills to interpret those images correctly” (Kartal & Arikan, 2008, pg. 95). Kartal and Arikan also believe that virtual teaching environments affect students differently than traditional teaching environments thus should be treated differently.

Continuing the focus on alternative reading comprehension strategies, Sporer, Brunstein and Kieschke (2009) investigated the effects of three different forms of strategy instruction on 210 elementary-school students' reading comprehension. The researchers assigned students to one of the three intervention conditions – reciprocal teaching (RT), instructor-guided reading (IG), and reciprocal teaching in pairs (RTP) – or to a traditional instruction condition. The intervention conditions, like RT, involve students forming their own questions, summarizing parts of the text, clarifying word meanings and confusing passages, and predicting what might come next in the text. Meanwhile, the traditional instruction consisted of an extensive amount of text interaction with age-appropriate reading material. The test results indicated that the intervention students attained higher scores on an experiment-developed task of reading comprehension and strategy use than the control students who received traditional instruction (Nadine, Joachim, & Keischke, 2009, pg. 283). Though the study did not involve multimedia-based readings, the results suggest that Internet can perhaps assist teachers in the improvement of reading comprehension. The Internet allows for users to plan their own learning process while simultaneously exploring similar information. A student may read an article or story online, stop to consider related features, browse clarifying pictures or illustrations, discuss the contents with other online users, and even search definitions or other resources to improve comprehension. Such behavior is most similar to the strategies found in the RT condition, which resulted in the highest test scores in the 2008 study.

Another study conducted by Grimshaw, Dungworth, McKnight, and Morris (2006) focused on the differences in children's comprehension and enjoyment of storybooks according to the medium of the presentation. One hundred thirty-two children read two, different

storybooks, *The Little Prince* and *The Magicians of Caprona*, in both printed and electronic versions. The children were split into two groups for each book and then split once more to read each medium version of the story. The students with the electronic version had access to an online dictionary while the students with the print version had access to a printed dictionary. The results indicated that the medium of the story did not significantly affect the children's enjoyment of the books or the students' comprehension scores. The only significant result was that the provision of narration, animations, and sounds effects in the electronic version of *The Little Prince* led to significantly higher comprehension scores than when narration was absent (Grimshaw et. al., 2006, pg. 594). The significant finding poses the idea that the interactive features found within the Internet may result in improved reading comprehension, but the researchers avoid making such claims. In their conclusion, Grimshaw et al. (2006) discuss the “crucial need for a clear distinction to be made between the different types of electronic books in terms of degree of interaction and animation that they offer and whether those features are supplementary or incidental to the story” (2006, pg. 598). The researchers add that some electronic books with a more “edutainment” nature often distract the reader from the story and interfere with story retention. They believe that failure to differentiate between the different types of electronic books could lead to improper use of such potentially valuable resources in both teaching and learning (Grimshaw et. al., 2006, pg. 598).

Such studies highlight the positive and negative effects of interactive reading yet continue to search for the line between beneficial interactivity and distracting interactivity. Regardless of the effect on user comprehension, any observer can clearly notice a change in reading technique between an individual reading a physical book in hand and reading a book on a computer



monitor. The behavioral changes are also a focal point for researches as they continue to investigate since the manner in which a user reads the online information can possibly affect his or her understanding of the piece.

### **Behavior Changes**

Due to the evolving nature of the Internet and website content layouts, researchers began to focus on the changes in user behavior to adapt to the online reading. One particular change is the pace at which users read information on the Internet. The overwhelming quantities of information placed within an easy-to-read website layout often results in users scanning material versus fully reading each provided sentence. Holmqvist, Holsanova, Barthelson, and Lundqvist (2003) examined the claims that net readers read deeper into articles than newspaper readers. The researchers also focused on the claim that newspaper readers scan rather than read the paper. Their study involved 26 participants – 12 net readers and 14 newspaper readers. The results disproved the initial claims as the net readers scanned more than the newspaper readers. Also, the newspaper readers were found to be less selective as they read some text on all the different pages (Holmqvist et al., 2003). The study also included an experiment regarding the layout of links on a news website. The results indicated that users expect to return to the home page as well as to have links presented on the left side of the page (Holmqvist et al., 2003). Much of the second experiment highlights the set of expectations held by most users due to Internet use and experience. Regardless of the content, most websites have a homepage, a navigation bar, and various links in order to access more information. Additional links are typically located on the right or left of the page while the homepage link is usually the logo image at the top of the page or the first of the navigation links. Web developers typically attempt to challenge the common

layout of a basic website in order to accommodate large amounts of information within a unique, aesthetically pleasing layout. Perhaps the continuation of changes and progression of new, innovative layouts will drastically change user expectation and behavior while potentially impacting the user comprehension.

Dyson and Haselgrove (2002) also considered the effects of reading speed during Internet use as they measured comprehension in fast and normal reading paces. The researchers also focused on how the readers scrolled through each document and the reading patterns. The results indicate a trade-off in a comprehension based on reading speed, which the researchers say “may be expected” (Dyson & Haselgrove, 2002). The results may have been anticipated, but they continue to support the idea that fast-paced screen reading, which is common on large Internet sites, will result in decreased comprehension. Given, website developers should consider the potential consequences of creating lengthy, scrollable websites as doing so would enable users to quickly browse through the site at a fast pace while jeopardizing reading comprehension.

Tewksbury, Hals, and Bibart (2008) sought to validate the behavioral distinction between two types of Internet readers – the selectors and the browsers. A selector is a user that searches for specific content defined by individual interests and needs while a browser is a user that uses the Internet to obtain information on a wide range of topics and to sample across new domains (Tewksbury et al., 2008). The researchers surveyed 241 residents of the Champaign-Urbana community to examine positive and negative consequences of new browsing behavior. The results indicated that newspaper browsers were typically Internet browsers as well, which shows that reader behavior can be carried across different media formats. The browsers appeared to distribute their reading across a number of topics and believed they know something about the

wide variety of them (Tewksbury et al., 2008). Such behavior or belief indicates that quantity is more socially important than quality when it comes to reading the news. Should such beliefs remain supported, websites will continue to embed large quantities of information within the pages. The exponential growth will likely result in the Internet becoming a convoluted, chaotic information portal. Further research should be conducted to indicate whether or not such Internet reading behaviors are beneficial for a user.

### **Method**

Much like the study conducted by Johnson et al. and their eyetracking technology, the following experiment brought forth results that indicate whether or not comprehension and recall is affected by website content layouts:

### **Sample**

The study took place at the campus of the Rochester Institute of Technology (RIT) in Rochester, NY. Participants were a convenience sample of 42 undergraduate and graduate students of both genders. The 42 participants were split into two groups – Group A and Group B – each consisting of 21 participants.

### **Group A**

The 21 participants in Group A were 52% male. Nine percent of the participants were 18-19-years-old; 48% were 20-21-years-old; and 43% were 22-years-old or older. Fifty-two percent of the participants were from the Golisano College of Computing and Information Sciences; 38% were from the College of Imaging Arts and Science; and 10% were from the College of Engineering at RIT.

### Group B

The 21 participants in Group B were 62% male. Nineteen percent of Group B participants were 18-19-years-old; 38% were 20-21-years-old; and 43% were 22-years-old or older. Sixty-seven percent of the participants were from the Golisano College of Computing and Information Sciences and 33% were from the College of Imaging Arts at RIT.

### Design

Four different, short news articles – *The Mystery of High Fructose Corn Syrup*, *The Cost of Obesity*, *Saving Baby Sea Turtles* and *The First 9 Months* – were selected and presented in both plain text and web-based formats (see Appendix A). Two of the articles, *The Cost of Obesity* and *Saving Baby Sea Turtles*, were included in the experiment to distract participants from the main articles, *The Mystery of High Fructose Corn Syrup* and *The First 9 Months*, which were presented in the opposing formats for the study. Group A read *The Mystery of Corn Syrup* in the plain text format and *The First 9 Months* in the web-based format while Group B read *The First 9 Months* in plain the text format and *The Mystery of Corn Syrup* in the web-based format. Both groups read the web-based version of *Saving Baby Sea Turtles* and the plain-text version of *The Cost of Obesity*, which also act as a control for the study (see Appendix B). To ensure validity of the test, the layouts of the two text-based stories were identical as well as the structure of the two web-based stories.

After a 30-minute period to read through the four articles, both groups were given a comprehension and recall test on all four stories. The two tests (Appendix C & D) consisted of 20 multiple-choice questions and four written, comprehension questions. Nine of the 20 questions pertain to the first test article, *The Mystery of Corn Syrup*, while eight more pertain to

the other test article, *The First 9 Months*. The remaining seven questions acted as dummy questions about the two control articles in order to distract the participants from the main test questions. Participants were asked to refrain from guessing their answers and to instead write “I don't know” or leave the question blank. Doing so helped maintain as much validity from the results as possible since participants were answering based on their knowledge and recall.

The remaining four questions were in the form of short-answer questions measuring reading comprehension since response choices were not provided. Half of the short answer questions pertained to *The Mystery of Corn Syrup* article while the other half pertained to *The First 9 Months* article. Regardless of the experienced article format, the short-answer questions were designed to elicit the participant's understanding of the readings. The answers were coded and analyzed much like a content analysis (see Appendix D) for keywords and structure in order to properly grade. Once concluded, the short-answer grades were combined with the multiple-choice answers for the participant's final test grade.

### **Procedure**

Once participants had settled into a seat in front of a computer, they were placed into either Group A or Group B based on seating location. The groups were gathered in a manner that maintained separation and blocked screen view from outside group members. The participants were then given a slip of paper on which the group-corresponding website URL was printed. Once each group member had the slip of paper, he or she was given 30 minutes to read the four, designated articles on the site.

After 30 minutes, both groups were told to minimize any browser windows or to simply turn off their monitors. They were all given the same test involving the multiple-choice and

short answer questions. The participants were asked to fill out the tests to the best of their ability without guessing any answers. Once completed, participants either handed in their test before leaving or remained seated until everyone was finished. Participants were asked to remain quiet while others completed the test.

The tests were collected and analyzed. Correct answers received a '1' while incorrect answers received a '0' for a grade. The scores were then added and directly compared.

The comprehension questions required some content analysis and coding in order to grade the responses. The answers were coded and grouped into various categories (see Appendix D). Length, detail, and accuracy of the comprehension answers were analyzed for proper grading. Correct answers received a grade of '1' per question while wrong answers received a '0.' Once each test was fully graded, a direct comparison was made between the Group A test results and the Group B test results in order to draw conclusions.

### Results

Group A question averages ranged from 0.0476 to 0.8095 while the averages in Group B ranged from 0.1429 to 1.0000. To answer whether or not a difference in recall and comprehension exists between reading plain-text news articles and interactive, web-based news articles, subjects' answers to the quiz questions about the two articles, *The Mystery of Corn Syrup* and *The First 9 Months*, must be analyzed. Table 1 displays the T-Test results for the participants (N=21) who read *The Mystery of Corn Syrup* in the multimedia-based format (CS-Multi) and the participants (N=21) who read *The Mystery of Corn Syrup* in plain text (CS-Plain):

Table 1

*T-Test Results for Readers of The Mystery of High Fructose Corn Syrup*

	N	Mean	StDev	SE Mean
CS-Multi	21	4.38	1.77	0.39
CS-Plain	21	4.36	1.53	0.33

The results ( $t = .05$ ,  $df = 30$ ,  $p = 0.963$ ) do not indicate a significant difference between the recall and comprehension scores of the two groups.

In Table 2, the results of the t-test between quiz scores on the second article, *The First 9 Months*, were also nonsignificant ( $t = -0.89$ ,  $df = 39$ ,  $p = 0.378$ ):

Table 2

*T-Test Results for Readers of The First 9 Months*

	N	Mean	StDev	SE Mean
9M-Multi	21	4.21	2.14	0.47
9M-Plain	21	4.76	1.83	0.4

Reading multimedia texts neither improved nor diminished recall and comprehension compared to a plain text version of the same article.

### Discussion

Given the nonsignificant results, much can be said regarding the existing research on website article presentation within the previously discussed topics: interactivity, literacy, reading comprehension strategies, and behavior changes.

While interactivity seemingly posed as a threat to efficient online reading or comprehension, some researchers considered how increased interactivity or how varied online presentations might impact user literacy and even the definition of literacy. In 2003, Coiro

claimed that the definition of literacy must change to include how individuals interact with technology. She also claimed, “Electronic texts introduce new supports as well as new challenges that can have a great impact on an individual's ability to comprehend what he or she reads” (Coiro, 2003, p. 458). The results of the current study suggest reconsidering Coiro's concerns. The present study revealed no difference in test score between reading plain-text and multimedia-based articles. Coiro does have a point that the definition of literacy may need to change in order to encompass newer and increasingly common technologies. The extreme popularity of Twitter, Facebook, or even the online reading gadget, Kindle, indicates that more people are using the Internet for reading or sharing information. Thus, perhaps the idea of 'literacy' will need to include the ability to read online text in the various formats found on such websites.

The similar study conducted by Johnson, Edwards, and Kues (2003) found that participants who received information in text were more likely to correctly recall information about names and places. Participants who received the multimedia-based story were more likely to recall unknown processes, procedures, or terminology (Johnson et al., 2003). The results of the current study do not indicate an advantage from experiencing either format, as participants' answers were consistent despite the detailed, name-based questions. Given that the studies were conducted with a similar procedure, the outcome of the present study suggests that young-adult Internet users are less likely to be affected by the presentation of Internet articles. Additionally, the seven-year span between the Johnson, Edwards, and Kues study and the current study suggests that perhaps users have become more Internet savvy or at least capable of adapting to the broad spectrum of website styles and interfaces.



Finally, the idea that Internet readings can cause behavioral changes remains an interesting claim to consider knowing the results of the present study. As previously discussed, Holmqvist, Holsanova, Barthelson, and Lundqvist (2003) examined the claims that net readers read deeper into articles than newspaper readers. Though their findings failed to support their claims, they did notice that net readers do in fact read differently than newspaper readers. Such behavioral changes may raise questions or concerns from anyone curious about the impact of Internet reading. The results of this study could offer some support that, despite the change of format or style, readers still recall and comprehend the same amount of information. Still, some limitations regarding this study must be considered.

The use of a convenience sample within the RIT campus immediately limits the findings, as the 42 participants do not represent any population. A larger and more randomized group of participants would hold more validity even if the results were consistent. Additionally, the use of college students may have produced an artifact, as testing is a common occurrence for such participants. A participant's testing or reading skills were not controlled in the present study. Also, participants may have ignored the request to use the "I don't know" answers and instead tried to guess the answer. Guessing the answers does not reliably demonstrate participant recall and comprehension thus could have negatively impacted the findings. A final limitation is the duration of the experiment portion of the study. Since participants were volunteering their own time, the experiment was planned within a 40 minute time period for the sake of brevity and convenience. The 40-minute limit may have caused some participants to speed read or to not experience the testing articles in the intended, casual manner. Thus, the change in reading style could have resulted in poor retention or comprehension, which would show in the test results.

### **Conclusion**

The goal of this study was to identify the changes in participant's recall and comprehension when reading a plain-text and a multimedia-based version of an online news article. The idea for the study was formed after nearly a decade of experiencing and learning the impact of the Internet as well as reading the large amounts of surrounding, inconclusive research. The Internet evolves at such a rapid pace that providing timely research is a very difficult feat. Yet, considering the results from smaller studies such as this one, perhaps a new level of Internet-based understanding can be reached.

Through the use of a convenience sample of 42 RIT students, this study has shown that a nonsignificant difference exists between a participant's recall and comprehension and the format of an online news article. As discussed, the results can offer a small amount of support for previous research claiming that the Internet can be an effective tool in the classroom, for sharing information, or simply for personal learning. Though the present study does not indicate any improvements in reading comprehension or recall, the idea that a user can experience a story in any format with consistent levels of understanding is useful for future Internet development.

A different approach to the study would include physical newspapers as a third variable. The inclusion of a third format, newspapers, would help identify if changes in recall and comprehension exist between reading online and on a physical paper.

Another approach would be to document the number of mouse clicks or computer interactions when reading the online articles. Perhaps a relationship exists between user recall and comprehension and levels of interactivity.

A third idea would be to conduct this study with a focus on age, as older generations are

stereotyped as poor Internet or technology users.

Regardless of which path the next researcher chooses to take, the questions will continue to flourish as will the call for answers. Is the Internet evolving into a positive, global resource for anyone with a computer or are users slowly falling into a state of over-stimulation while drowning in information? Perhaps we will learn the answers sooner than later, but for now at least this study is a small indication that Internet users can adapt to the unpredictable changes.

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## Appendix A

### Article Layouts

Figure A1: Multimedia-based format:

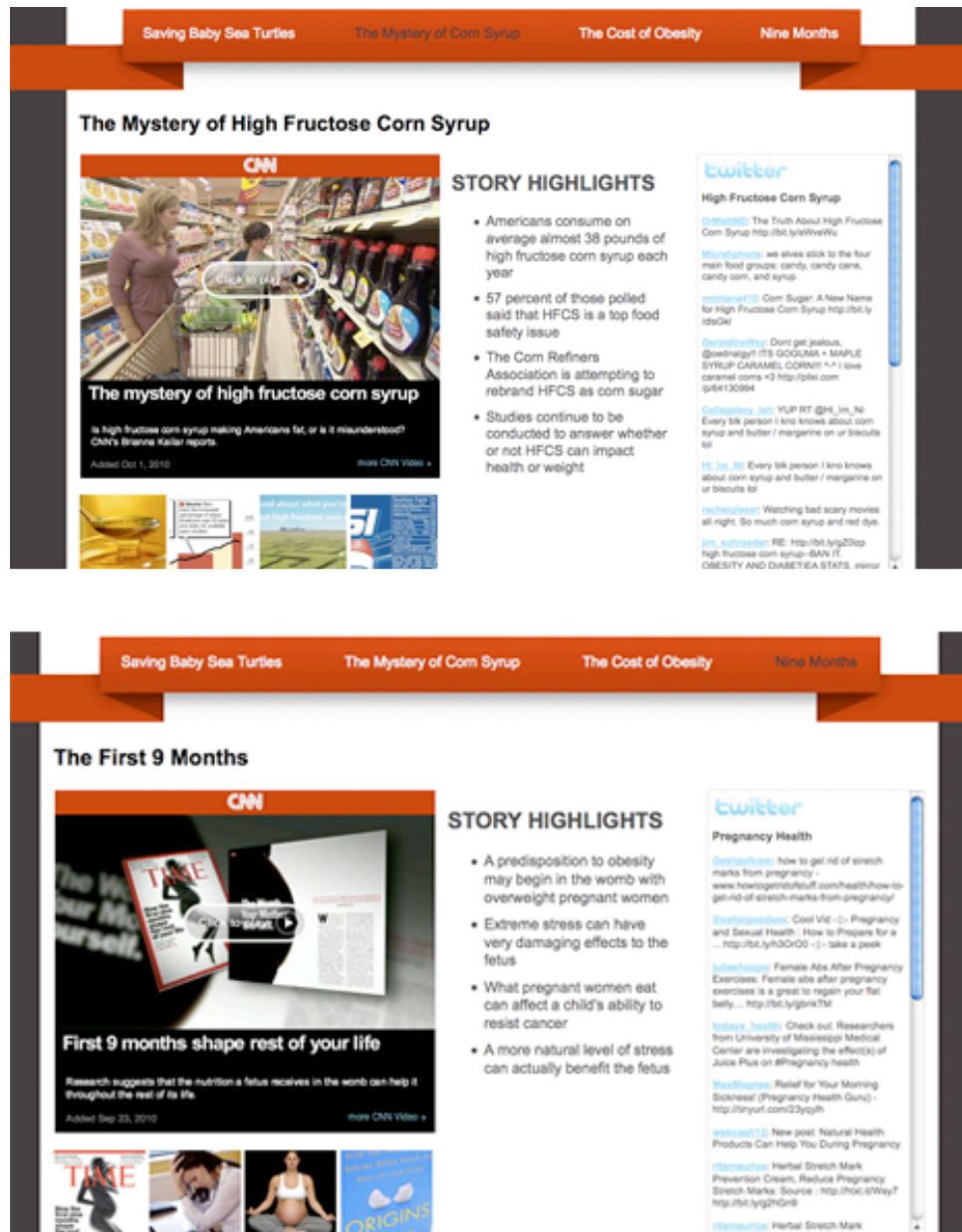


Figure A2: Plain-text format:

Saving Baby Sea Turtles
The Mystery of Corn Syrup
The Cost of Obesity
Nine Months

### The Mystery of High Fructose Corn Syrup



Just walk down the aisle of your grocery store, check out the ingredients on labels, and you'll see the same thing over and over. It's in pancake syrup, cookies, ketchup, jelly, even cereal and soup. "High fructose syrup is the third ingredient in tomato soup after tomato and water. So there you go. People think, "Oh, tomato. It's a vegetable. I'm giving my child a vegetable serving."

Each year, American's consume on average almost 38 pounds of high fructose corn syrup. But not Jessica Haney; this mother of two and the voice behind the blog, called Crunchy Chewy Mama, has put the corn-based sweetener out of her family's diet. "It's not just squeezing out the corn and getting the sugar, it's not that you're eating corn or a vegetable, it's a highly industrialized product that has been shown to do lots of yucky things in your body and we just don't need it."

Many Americans are convinced that high fructose corn syrup is one of the culprits of the country's obesity epidemic. In a recent study, 57 percent of those polled said that it was a top food safety issue; right up there with artificial growth hormones in milk and mad cow disease. That concern is reflected in the demand for food that's free of high fructose corn syrup. Just check out Pepsi's newest offering: Sierra Mist made with real sugar. For all of the bad buzz around high fructose corn syrup, a number of studies suggest that there is no difference between how the body responds to it versus plain old sugar. In 2008, the American Medical Association said that "insufficient evidence exists to specifically restrict use of high fructose corn syrup," but the issue isn't settled. The AMA also encouraged "independent research (including epidemiological studies) on the health effects of HFCS."

I visited Belmont University because that is where one of the most recent studies

Saving Baby Sea Turtles
The Mystery of Corn Syrup
The Cost of Obesity
Nine Months

### The First 9 Months



New research warns that stress levels, pollution, and infections can also affect your baby not just in the womb but as a child growing up and all the way into adulthood. Annie Murphy Paul wrote a cover story for the topic in Time Magazine. Her new book on the research, *Origins*, is due out Tuesday.

CNN: We've all heard the rules 'don't drink, don't smoke, take folic acid, make sure that you eat well while your pregnant,' but this goes well beyond all that.

Annie Murphy Paul: There is an emerging science known as fetal origin that suggests that a lot of the things that women experience and encounter during pregnancy affects their fetus in a way that lasts throughout that child's youth and into adulthood. So when we break that down, one of the concerns and one of the things they have amended over the years has been how much weight you gain during pregnancy and this is, of course, a source on both sides of the issue. People worry so much about gaining too much weight and there are others who say "it's my one chance to eat for two and if I balloon up 70-100 pounds, then okay."

CNN: What are these people learning about what obesity or even significant weight gain does?

AMP: Well, since Americans are getting heavier and heavier with weight gain starting earlier and earlier, the new thinking is that a predisposition to obesity begins in the womb with an overweight pregnant woman or a woman who gained excessive weight during the pregnancy. This programs the fetuses appetite and metabolism to make them in turn more likely to become obese so we're rethinking the guidelines on how much pregnant women should gain.

## Appendix B

### Control Article Layout

Figure B1: Control articles:





*Appendix C***Post-Reading Questionnaire**

Please select your gender:

- ☐ Male  
☐ Female

Please select your age group:

- ☐ Younger than 18 years of age  
☐ 18 – 20 years of age  
☐ 20 – 22 years of age  
☐ 22+ years of age

Please indicate the college of your degree program (Example: Engineering or Liberal Arts): \_\_\_\_\_

Multiple Choice Questions:

1.) What is the average amount of high fructose corn syrup consumed by Americans each year?

- ☐ 57 pounds  
☐ 24 ounces  
☐ 14 pounds  
☐ 38 pounds

2.) What is the percentage of obese American men and women in a recent study?

- ☐ Half the population  
☐ A third of the population  
☐ 75% of Americans  
☐ Nearly 90% of Americans

3.) Which University conducted the study mentioned in Question #2?

- ☐ Princeton University  
☐ Oregon State University  
☐ George Washington University  
☐ Brown University

4.) What is the name of the author who was featured in TIME Magazine for her work

regarding fetal origins research?

- ☐ Sally Marie Thompson
- ☐ Annie Murphy Paul
- ☐ Anne Marie Hall
- ☐ Sarah Elizabeth Powell

5.) What is the name of the upcoming book written by the author in Question #4?

- ☐ The First Nine Months
- ☐ Grow, Baby, Grow
- ☐ Origins
- ☐ The Edge of Fetal Origins

6.) How long does it take for a baby sea turtle to surface from the buried egg nest?

- ☐ Days
- ☐ Weeks
- ☐ Hours
- ☐ Minutes

7.) In a recent poll, how many Americans believed that high fructose corn syrup is a top food safety issue?

- ☐ 63%
- ☐ 57%
- ☐ 42%
- ☐ Less than 10%

8.) What was the name of the disastrous campaign in China in the middle of the last century?

- ☐ The Great Change
- ☐ The Great Generation
- ☐ The Great Leap Forward
- ☐ The Great New China

9.) What is the difference in economic cost between obese men and obese women?

- ☐ No difference
- ☐ \$550
- ☐ Between \$1,000 to \$1,500
- ☐ Over \$2,000

10.) Who started the Tree Foundation?

- ☐ Steve Walson

- ☐ Rivka Holztberg
- ☐ Supraja Dharini
- ☐ Deepika Padukone

11.) How is the Corn Refiners Association trying to rebrand high fructose corn syrup?

- ☐ By using the name 'corn sugar'
- ☐ By airing multi-million dollar ads
- ☐ By raising awareness
- ☐ All of the above

12.) After the campaign mentioned in Question #8, which disease became more common among young adults?

- ☐ ADHD
- ☐ Autism
- ☐ Schizophrenia
- ☐ Bipolar Disorder

13.) Which of the following is not affected by obesity?

- ☐ Hospital costs
- ☐ Wages
- ☐ Food costs
- ☐ School costs

14.) Which type of vegetable are broccoli or brussels sprouts?

- ☐ Cruciferous
- ☐ Allium
- ☐ Composite
- ☐ Mallow

15.) Who is the president of the Corn Refiners Association?

- ☐ Shawn Yables
- ☐ Michael Jones
- ☐ Samantha Potters
- ☐ Audrae Erickson

16.) According to new research, which of the following is not listed as having an affect on a fetus?

- ☐ Pollution

- ☐ Weather
- ☐ Infections
- ☐ Stress levels

17.) Which of the following foods does Jessica Haney allow her family to eat?

- ☐ Honey
- ☐ Molasses
- ☐ Maple Syrup
- ☐ All of the above

18.) Why do obese women have a tendency to have a lower wage than obese men?

- ☐ Society isn't all that fair
- ☐ It's against the law to pay women more than men
- ☐ Men are less about aesthetics than women
- ☐ Women are more of a focal point in certain industries

19.) In 2008, which group of health experts said that "insufficient evidence exists to specifically restrict use of high fructose corn syrup?"

- ☐ U.S. Department of Health and Human Services
- ☐ Food and Drug Administration
- ☐ American Medical Association
- ☐ U.S. Department of Agriculture

20.) What did the group mention in question #19 encourage?

- ☐ "Independent research on the health effects of HFCS"
- ☐ "Student research on the health effects of HFCS"
- ☐ "Immediate research on the health effects of HFCS"
- ☐ "Human-based research on the health effects of HFCS"

Short Answer:

- Explain how Bart Hoebel and his researchers conducted their high fructose corn syrup experiment on the rats:

- Considering the fetal origins research, explain how the eating habits of pregnant women can impact the fetus:
- Explain, first, why the Corn Refiners Association is attempting to rebrand high fructose corn syrup and, second, how they are going about the rebranding process:
- Explain the types of effects that extreme and everyday stress have on a fetus:

*Appendix D*

**Comprehension Question Code**

State of the answer:

Answer was not given = 0 TOTAL

Answer was given = 1

Answer length:

Less than 20 words = 1

Between 21 and 100 words = 2

Over 100 words = 3

Use of detail within answer:

No detail is included = 1

General information = 2

Very detailed (names and locations are included) = 3

A question scoring under 4 coded points receives a 0.

A question scoring 4 coded points or above receives a 1.

*Appendix E*

**Literature Review Research Process**

Years Searched: 1999 – 2009

Databases Searched in RIT Wallace Library:

- Academic Search Elite (EBSCO)
- Communication and Mass Media Complete (EBSCO)
- ComAbstracts (CIOS)
- ebrary
- OmniFile Full Text Mega (Wilson)
- 

Keyword Search:

- Internet & comprehension
- Internet & reading
- interactivity & Internet
- interactivity & comprehension
- students & reading & Internet
- comprehension & computers
- reading & online
- Internet & memory
- Internet & recall
- multimedia & comprehension
- multimedia & interactivity
- online learning & comprehension
- Internet & reading & layout
- layout & text & reading
- website design & comprehension
- website design & interactivity
- online reading & newspaper reading
- plain-text & comprehension
- computers & reading
- online & learning
- computers & learning
- SmartText using variations of listed keywords