Investigating college students' reading strategies in online versus conventional print-dependent settings

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Abstract

This study investigates the reading strategies of EFL college students to identify and comparatively analyze the differences between online reading versus printed material reading strategies. This study draws on the hypothesis that highly strategic readers of printed materials would also be highly strategic online readers. A mixed-methods approach to research was utilized to answer the quantitative and qualitative questions of the study and confirm the hypothesis of the study. Analysis of the collected data utilizes quantitative data collected through two surveys and qualitative data collected through a think-aloud protocol, where the researcher interprets verbal responses of the informants in the study and code these responses into categories of the used reading strategies in online and print modes. As well, scores from a standardized reading comprehension test and a strategy identification questionnaire were used for the analysis. Results verified the hypothesis of the study and answered the main research questions.

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استقصاء استراتيجيات القراءة في بيئات التعلم الإلكترونية
مقارنةً ببيئات القراءة التقليدية المعتمدة على المادة المطبوعة لدى طلاب الجامعة

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الملخص

هدفت هذه الدراسة إلى استقصاء استراتيجيات القراءة لدى طلاب اللغة الإنجليزية كلغة أجنبية في المستوى الجامعي لتعرف وتحليل ومقارنة الفروق بين استراتيجيات القراءة في بيئات التعلم الإلكتروني مقارنة باستراتيجيات القراءة التقليدية المعتمدة على المادة المطبوعة. وقامت الدراسة على فرضية مؤداها أن القُرَّاء الذين يعتمدون بكثيرة على استراتيجيات القراءة التقليدية مع المواد المطبوعة هم أيضاً قُرَّاء أفضل للمواد المتاحة على الإنترنت. وقد استخدم الباحث مدخلاً يعتمد على تثليث البيانات للإجابة عن تساؤلات الدراسة النوعية والكمية، وللتحقق من الفرضية التي قامت عليها الدراسة. وقد اعتمد تحليل البيانات على استبانتين مسحيتين لتحليل البيانات الكمية كما اعتمد على بروتوكول القراءة الجهرية؛ حيث قام الباحث بتأويل استجابات المفحوصين في الدراسة وصنفها إلى استراتيجيات للقراءة التقليدية للمادة المطبوعة واستراتيجيات القراءة على الإنترنت. كما استفاد الباحث من تحليل نتائج اختبار مقنن في الفهم القرائي واستبانة تحديد استراتيجيات القراءة في تحليلاته الإحصائية للنتائج. وقد حققت النتائج فرضية الدراسة وأجابت عن التساؤلات الرئيسة للبحث.

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Introduction

EFL learners are now widely using online learning platforms such as Blackboard for learning processes, classroom assignments and information seeking purposes. During the last three decades, the Internet has developed to be an elemental factor contributing to economic, educational and social change, spurring swift waves of globalization which impacted the different sectors in the society and worldwide (Aldosari & Mekheimer, 2013; Riley, 2005). Recent research findings indicate that with the advent of the Internet, learners need to develop new online reading strategies that would help them deal with online texts (Coiro & Dobler, 2007; Coiro, Malloy, & Rogers, 2006).The problem identified is that EFL learners might come across online reading comprehension difficulties which need them to develop reading strategies to help them comprehend what they read online. A common misconception that if learners can use the Internet, they would be able to read online well, but this is not always true (Bransford, 2004; McEneaney, 2003; 2006). Therefore, researchers and practitioners in EFL education need more research to investigate online reading strategy use in order to establish best practices in the conventional and virtual classrooms and also for students to learn how to read online efficiently (Kamil & Lane, 1998; McEneaney, 2003; 2006).

It is expected that the present study will compliment extant literature, which suffers from paucity in research efforts in the area of online reading strategies in terms of analysis and taxonomy. In addition, the mixed research methodology and field research will help enhance EFL classroom practices, especially in the growing online learning settings as in Blackboard platforms. The results of the study will describe the most and best used online reading strategies that are effective and more efficient for EFL learners which will help assist them use the appropriate and more effective online reading strategies.

This present study aims to analyze, identify and build a reasoned taxonomy of online reading strategies and print reading strategies adopted by EFL learners while doing their reading comprehension assignments. It also aims to recognize the differences between online reading strategies and printed material reading strategies against a background of reading research and in the light of conventional reading skills and internet use habits.

Literature Review

The Internet is omnipresent on smart phones, smart TVs, laptops, desktops, iPads, iPhones and other forms of phablets. With the emergence of these technologies, a new information age has come and reshaped our ways to read and

write, using web browsers, search engines, weblogs, wikis with their constituent hypertext and hypermedia (Leu, et al., 2015; Leu et al., 2004; Reinking, 1998). Crudely put, "no previous technology for literacy has been adopted by so many, in so many different places, in such a short period of time, and with such profound consequences" (Coiro et al, 2008). Recent research on reading strategies indicates that the Internet generations need to develop new reading strategies and adapt traditional reading skills and strategies to use them effectively in online millieus in order for them to comprehend reading materials available in cyberspace because etexts incorporate hyperlinks and hypermedia different from the linear format of printed materials (Coiro & Dobler, 2007; Coiro et al, 2008). The new online reading skills and strategies may includes ones that help the new generation readers to use effective keywords in engine searches, inferencing, critical thinking, evaluation, analysis, synthesis, and a large array of strategies needed to make meaning and critically evaluate online texts (Bulger, 2006; Fabos, 2004; Henry, 2006; Jenkins, 2006; Kuiper & Volman, 2008; Leu, et al., 2006).

A plethora of prior research identified and categorized learning strategies in the EFL context, and only a few did so in the area of reading strategies involved in conventional text-oriented settings (Burke, 2000; Mokhtari & Reichard, 2002; Pintrich, Wolters, & Baxter, 2000; Pressley & Afflerbach, 1995). However, even less research was conducted to examine reading strategies used with online texts (Potelle & Rouet, 2003; McNamara & Shapiro, 2005; Salmeron, et al., 2005; McEneaney, 2003). Research efforts are scanty and scattered in investigating online reading strategy use as scholars and language educators still know little about the quality and type of strategies online readers employ for reading comprehension of etexts (Coiro et al, 2008; Eagleton & Guinee, 2002; Kymes, 2005; Leu, Castek et al, 2005; Sutherland-Smith, 2002).

For reading strategies in conventional settings, Pressley and Afflerbach (1995) conducted a comprehensive research for the analysis and classification of reading strategies where they analyzed in their meta-analysis thirty-eight fundamental research studies on reading strategy use. The researchers recognized and classified thirty-two distinct strategies that are effective in contributing to efficient reading comprehension. Other researchers showed that the more strategies readers use on interacting with the texts, the more successful they do (Garner, 1992; Pearson, et al., 1992; Pressley, El-Kinary, & Brown, 1992; Wilhelm, 2001). The significant part about previous research is that findings showed that strategies that make use of metacognition and self-regulation assist readers to comprehend texts more systematically (Pearson, Roehler, Dole, & Duffy, 1992; Garner, 1987; 1992).

These advances in communication technologies have given rise to two theories: the new literacies theory and the cognitive flexibility theory (Coiro et al, 2008). The first perspective of new literacies theory posits that the age of online reading has brought changes to the nature of literacy and learning which requires new skills, strategies, dispositions, and social practices to deal with the new information and

communication technologies (Leu, et al, 2004; Wyatt-Smith & Kimber, 2010). According to this theory, reading comprehension is viewed as a problem-solving and inquiry-based learning process that can be tackled by new skills and strategies of locating information online, comprehending, analyzing, synthesizing, and critically evaluating it against a wide array of online resources rapidly navigated in unfamiliar websites (Leu, et al., 2004).

The second theory of cognitive flexibility proposes that the Internet is an ill-structured milieu, rich in unprecedentedly big amounts of information, though. This milieu requires readers to be constantly flexible and continually adaptive to the ever-changing nature of online available texts (Spiro et al., 1991).

In this line, Spiro (2004) maintains that traditional learning/reading strategies may not work efficiently with e-texts; therefore, there is a dire need to investigate the strategies and skills that contribute more easily to reading comprehension in online environments.

Considering these two theories, one may conclude that college readers can form new protocols and strategies for online reading or can transfer their learning strategies from traditional contexts to online milieus, but they will develop situational models that differ greatly from traditional reading situations. Whether students read traditionally or online texts, they need to actively relate new information to their schemata, the existing information in their cognitive structures, in order to be able to use it later - a process that requests "strategic action and effort on the part of the reader/learner" to develop a sufficient level of automaticity and construct appropriate academic habits (Kintsch, 2004, p. 1275).

In online reading settings, Anderson-Inman & Horney (1994) could recognize 6 strategies e-learners use: i.e., skimming, checking, reading, responding, studying, and reviewing. In this vein, too, Britt and Gabrys (2001) identified a set of advanced literacy skills such as sourcing, corroborating, integrating which learners need for online reading. McNamara & Shapiro (2005) emphasized the skill of corroboration which assists online readers in making connections and inferences between multiple electronic texts.

However, given the discrepancies between reading print and online reading, traditional reading skills and strategies appear significantly needed when reading e-texts (Foltz, 1996; Goldman, 1996; Rouet., et al., 1996). For instance, Foltz (1996) argues that online readers need to use their schemata and background knowledge when they try to read online in the same way as they do when they read print texts. However, with this skill of using background knowledge, online readers can "exploit some of the less coherent links in the hypertext" (Foltz, 1996, p.128). Styll, some scholars content that online reading texts require different skills and strategies (Wenger and Payne, 1996; McEneaney, 2003), since online reading material is presented in hypertext and "the skills of monitoring and evaluating comprehension become more important than in a linear text environment" (Goldman, 1996, p.34) because hypertext materials require search and retrieval skills unmet in print texts.

Furthermore, online texts can help create true interaction between the reader and the text as is the case in social media postings and discussions or in wikis and web-blogs. Some scholars, therefore, referred to online reading strategies newly identified in online reading environments such as skimming, browsing, and selecting (Burke, 2002; Coiro, 2003; Large & Beheshti, 2000). According to Elshair (2002), online reading is a purported process of meaning-making through reading comprehension strategies whereby to structure a website and interact with its texts and hypertexts in a way that assists in elaborating, recalling and evaluating online information.

In summary, there are two types of strategies used in reading for comprehension – one is cognitive and the other is metacognitive. The cognitive strategy use involves the utilization of prior knowledge, and motivational dispositions towards reading while metacognitive strategy use involves the use of organization, selective attending and directed attending to reading materials, ignoring irrelevant distractors for regulating self-directed learning and raising learners' awareness of how language works, and what to do so as to save time, effort, and frustration while using the language in communication. The first type of cognitive strategies "involves the active mental engagement of the learner in the purposeful establishment of new functional knowledge through contextualized practice, and the formation of stable and meaningful connections between prior knowledge and new information" (Vandergrift, 1996, p. 218). The second type of metacognitive strategies involves mental activities for directing the learning process such as planning, self-monitoring and self-evaluation. Both types of strategy use are used in traditional print reading inasmuch as they should be used in online reading.

Research Methodology

Method, Sample and Instruments

An experimental method of research involving two experimental groups of college reading students (30 students each) was employed involving a mixed-methodology for collecting quantitative and qualitative data for the present study. A think-aloud methodology was used to collect information about the processes and strategies used in online and conventional reading. A reading comprehension test and reading strategy questionnaires were post-administered.

All of the students in the two groups completed three survey inventories. These were the Metacognitive Awareness Reading Strategies Inventory adapted from (Mokhtari & Reichard, 2002) and an adapted version of the Online Survey of Reading Strategies developed by Anderson (2003). The first survey inventory is a self-report survey of strategy use in traditional settings where print materials are used for reading and is intended to collect information on such strategies like note-taking, previewing, reviewing and rereading (with a reliability co-efficient of .93). The second survey inventory is another self-reported survey on strategy use in online environments. Both inventories were nearly one-hour, 5-point Likert scaled questionnaires.

Procedures

Student participants in the present study were drawn from the Level 2 students enrolled in a medical college in King Saud University at Riyadh studying English for medical purposes. The students were in two classes: one studied the course in a conventional, classroom-based instruction and the other was enrolled in an online Blackboard virtual class. After administration of the surveys, students were identified into highly effective readers versus lowly effective readers and more involved online readers versus less involved online readers. This identification of the sample helped identify patterns of similarity between the four types of readers in this study. The participants then were invited to take part in the think-aloud procedure. In this procedure, individual students were requested to do three practice tasks requiring them to solve a problem and think-aloud, each in their respective groups. The three reading tasks involved reading newspaper article excerpts for making speculations, extrapolations and problem-solving. Upon completing the three tasks, the experimenter read out directions for the students while they searched for and read information online.

Research questions

The main research question underlying this study is:

What are the college students' reading strategies in online versus conventional print-dependent settings?

This question branches off into the following sub-questions:

1- What strategies do college students use when they read printed texts in conventional settings?

2- What strategies do college students use when they read online texts in e-learning settings?

3- Does environment affect college students' reading strategies when they read online compared with conventional print reading? Or in other words, does strategy use exist in one format more than in the other?

4- What factors affect strategy use upon reading in both formats?

5- How do college readers perceive of their reading strategies when they read online texts?

Results of the study

The results here are presented from the quantitative measures of both survey inventories and the qualitative measures from the think-aloud protocols used after survey administration. The results are presented vis-a-vis the research questions to provide descriptive statistics on strategy use in online versus print reading settings.

Data from Quantitative Measures

For the first research question, tapping into the strategies college students use when they read printed texts in conventional settings, students completed the Metacognitive Awareness of Reading Strategies Inventory to investigate the students' strategies reported while being engaged in print reading tasks. According to Mokhtari & Reichard (2002), mean scores on this survey inventory above 3.5 indicate high scores, 2.5-3.4 indicate average responses and

below 2.4 indicate low responses.

Table 1 below summarizes the aggregate total of responses for both experimental groups, divisible into low, average, and high reading comprehension sub-groups.

Table 1: Descriptives from the Metacognitive Awareness of Reading Strategies Inventory: Strategies by Usage Level

Sub-groups	N	Minimum	Maximum	Mean	SD
High	27	2.22	4.61	3.30	.567
Average	21	2.31	4.74	3.33	.602
Low	12	2.28	4.11	3.22	.697

All participants in both experimental groups were identified by their scores on the Metacognitive Awareness of Reading Strategies Inventory as average scorers, given their mean scores on the survey which exhibited little variance in mean scores by sub-groups. Therefore, a one-way ANOVA was run as is shown in Table 2 below. Results of this one-way ANOVA indicate a statistically insignificant *F* ratio (.357).

Table 2: One-wat ANOVA run for Responses on the Metacognitive Awareness of Reading Strategies Inventory by Sub-groups

	Sum of Squares	DF	Mean Squares	F	Sig.
Between-groups	.304	2	.149	.361	.689
Within-groups	27.789	58	.419		
Total	28.113	59			

The responses of the participants in both groups on the Metacognitive Awareness of Reading Strategies Inventory addressed the 30 items on the survey and produced a taxonomy of the reading strategies used by the participants to include three types of strategies: global reading strategies, problem-solving reading strategies and Supporting strategies for reading. Global reading strategies are almost cognitive strategies spanning a wide range of strategies such as skimming, scanning, previewing texts, activating prior knowledge, eliciting global answers to global comprehension questions, etc. Problem-solving strategies are almost metacognitive, including reading and stopping at each paragraph for reflecting, attending to text structures, reading aloud, reading for scanning information, etc. Supportive reading strategies are cognitive and metacognitive in type and include such strategies as note-taking upon reading, paraphrasing or rephrasing, self-question and self-regulating while reading. Table 3 below summarizes this taxonomy by the mean scores of the participants.

Table 3: Descriptives of Strategy Type by Category on the Metacognitive Awareness of Reading Strategies Inventory

Category of Strategy	N	Minimum	Maximum	Mean	SD
Global	23	3.22	4.45	4.18	.556
Problem-solving	18	3.17	4.68	3.97	.598
Supportive	19	2.88	4.22	3.36	.611

The participants in this study has the highest mean score in the category of problem-solving strategies and gained the lowest mean score in the category of supportive strategies.

Table 4 –Descriptives of the Metacognitive Awareness of Reading Strategies Inventory by question

Question	Minimum	Maximum	Mean	SD
1- I have a purpose in mind when I read.	2.00	5.00	3.44	1.11
2- I take notes while reading to help me understand what I read.	1.00	5.00	2.29	1.41
3- I think about what I know to help me understand what I read.	1.00	5.00	3.74	1.14
4- I preview the text to see what it's about before reading it.	3.00	5.00	3.48	1.31
5- When the text becomes difficult, I read aloud to help me understand what I read.	1.00	5.00	3.32	1.37
6- I summarize what I read to reflect on important information.	2.00	5.00	2.99	1.31
7- I think about whether the content of the text fits my reading purpose.	1.00	5.00	2.91	1.24
8- I read slowly but carefully to be sure I understand what I am reading.	2.00	5.00	3.50	1.39
9- I discuss what I read with others to check my understanding.	2.00	5.00	2.64	1.19
10- I skim the text first for length and organization.	1.00	5.00	2.54	1.37
11- I try to get back on track when I lose concentration.	3.00	5.00	4.19	.889
12- I underline or circle information in the text to help me remember it.	2.00	5.00	3.19	1.59
13- I adjust my reading speed according to what I'm reading.	2.00	5.00	3.58	1.31
14- I decide what to read closely and what to ignore.	2.00	5.00	3.88	1.31

Question	Minimum	Maximum	Mean	SD
15- I use reference materials such as dictionaries to help me understand what I read.	1.00	5.00	2.54	1.44
16- When the text becomes difficult, I pay closer attention to what I'm reading.	3.00	5.00	4.31	.989
17- I use tables, figures, and pictures in the text to increase my understanding.	1.00	5.00	3.41	1.21
18- I stop from time to time and think about what I'm reading.	2.00	5.00	3.32	1.34
19- I use context clues to help me better understand what I'm reading.	1.00	5.00	3.22	1.34
20- I paraphrase (restate ideas in my own words) to better understand what I read.	1.00	5.00	3.54	1.34
21- I try to picture or visualize information to help me remember what I read.	3.00	5.00	4.33	.884
22- I use typographical aids like boldface and italics to identify key information.	1.00	5.00	3.54	1.39
23- I critically analyze and evaluate the information presented in the text.	1.00	5.00	2.97	1.14
24- I go back and forth in the text to find relationships among the ideas in it.	3.00	5.00	2.91	1.31
25- I check my understanding when I come across conflicting information.	1.00	5.00	3.43	1.24
26- I try to guess what the material is about when I read.	3.00	5.00	3.28	1.34
27- When the text becomes difficult, I re-read to increase my understanding.	2.00	5.00	4.54	.781
28- I ask myself questions I like to have answered in the text.	1.00	5.00	2.78	1.29
29- I check to see if my guesses about the text are right or wrong.	1.00	5.00	2.99	1.33
30- I try to guess the meaning of unknown words or phrases.	1.00	5.00	3.60	1.24

Informants to this survey scored in an average range (M=3.3) as far as they perceive their strategy use in reading print materials. This result indicates some degree of variance in the scores of the informants, but is not sufficiently statistically significant. Having categorized the responses of informants in three classes according to the type or category of strategies employed, global, problem-solving and supportive, the informants significantly scored the highest on global strategies (M = 4.18), then on problem-solving strategies (M=

3.97) and finally on supportive strategies (M=3.36). These results indicate that the participants in the study were global, convergent thinkers when they read print texts. Some of these skills are cognitive, but the majority are metacognitive. This finding is consistent with prior research on reading strategy use (Howard, 1985; Mokhtari & Reichard, 2002; O'Malley & Chamot and Kupper, 1989; O'Malley & Chamot, 1990). This is explained by what relevant literature indicates that effective readers make use of both top-down and bottom-up processing strategies while ineffective readers become embedded in determining the meanings of individual words. Global strategy use helps readers male use of both top-down and bottom-up processing while they are reading printed materials in a linear fashion (Howard, 1985). The findings from this study could reveal significant differences in students' utilization of global reading strategies in reading ability.

For the second research question tapping into the online reading strategies of college students, the researcher used the Online Reading Strategies Inventory, a thirty-six item survey that correspond to the categories of strategies and question types of the first survey inventory, but referring to reading strategies employed in online learning milieus.

Table 5 below summarizes the aggregate total of responses for both experimental groups, divisible into low, average, and high reading comprehension sub-groups in online reading.

Table 5: Descriptives from Online Reading Strategies Inventory: Strategies by Usage Level

Sub-groups	N	Minimum	Maximum	Mean	SD
High	31	2.64	4.94	3.51	.588
Average	24	2.33	4.58	3.64	.711
Low	5	2.63	4.41	3.44	.523

Participants identified as average strategy users outperformed their peers on online reading strategy use, while students in the high group were next in rank. This means that both high and average strategy use groups fall in the range of high online reading strategy use while students in the low group scored below 3.5, thus indicating low responses in this category.

Given that variance in mean scores of the three sub-groups, a one-way ANOVA was run to the mean scores on the Online Reading Strategies Inventory, yet with a statistically insignificant F ratio (F=.394) as shown in Table 6 below:

Table 6: One-way ANOVA run for Responses on the Online Reading Strategies Inventory by Sub-groups

	Sum of Squares	DF	Mean Squares	*F*	Sig.
Between-groups	.298	2	.154	.394	.687
Within-groups	24.89	58	.417		
Total	25.411	59			

Responses to the 36 items on the Online Reading Strategies Inventory yielded a similar taxonomy of online reading strategies that could be classified into three types: global online reading strategies, online problem-solving strategies, and online supportive strategies.

Global strategies are, however, metacognitive, including directed attention, selective attending, purposeful reading, planning for reading, self-monitoring and self-evaluation by considering the typographical features of online reading material.

Problem-solving strategies identified include phonemic awareness, accommodating reading speed to screen movement, reading aloud on the screen, and other mental processes online readers use to manipulate the target language text to accomplish a given task, such as elaboration, association cognates, transferring, repetition, resourcing, note-taking, deduction and imagery.

Supportive strategies include taking notes on electronic notepads, printing out hard copies of online reading materials, resourcing, using hypertexts to access additional information, opening additional reference links for clarification, elaboration or understanding.

Table 7: Descriptives of Strategy Type by Category on the Online Reading Strategies Inventory

Category of Strategy	N	Minimum	Maximum	Mean	SD
Global (GLOB)	23	3.11	4.44	3.57	.341
Problem-solving (PROB)	26	3.58	4.78	3.88	.273
Supportive (SUP)	11	2.22	3.63	3.21	.555

Problem-solving strategies in online reading were more frequently used by the participants, then global strategies and finally supportive strategies.

Table 8. Descriptives of the Online Reading Strategies Survey (N=30)

Strategy Items	M	SD
1- I have a purpose in mind when I read online.	3.54	0.96
2- I participate in live chat with other learners of English.	3.12	1.28
3- I participate in live chat with native speakers of English.	3.14	1.31
4- I take notes while reading online to help me understand what I read	3.81	0.94
5- I think about what I already know to help me understand what I read online.	4.27	0.83
6- I first scroll through the online text to see what it is about before reading it.	4.27	0.88
7- When an online text becomes difficult, I read aloud to help me understand what I read	2.63	1.55
8- I analyze whether the content of the online text fits my reading purpose.	3.94	0.88
9- I read slowly and carefully to make sure I understand what I am reading online.	3.94	1.21
10- I review the online text first by noting its characteristics like length and organization.	3.77	1.14
11- I try to get back on track when I lose concentration.	3.77	1.29
12- I print out a hard copy of the online text then underline or circle information to help me remember it.	2.89	1.27
13- I accommodate my reading speed according to what I am reading online and to screen movement speed.	3.79	1.11
14- When reading online, I decide what to read carefully and what to ignore.	3.74	1.05
15- I use tables, figures, and pictures in the online text to increase my understanding.	3.81	1.02
16- I stop from time to time and think about what I am reading online.	3.53	1.12
17- I use context clues to help me better understand what I am reading online.	3.81	1.02
18- I paraphrase (restate ideas in my own words) to better understand what I read online.	3.24	0.97
19- I try to picture or visualize information to help remember what I read online.	3.66	0.87
20- I use typographical features like bold face and italics to identify key information.	3.96	0.92
21- I critically analyze and evaluate the information presented in the online information.	3.39	0.65
22- I go back and forth in the online text to find relationships among ideas in it.	3.61	0.98

Strategy Items	M	SD
23- I check my understanding when I come across new information.	4.04	0.82
24- I try to guess what the content of the online text is about when I read.	4.17	0.98
25- When online text becomes difficult, I reread it to increase my understanding	4.22	0.99
26- I ask myself questions I like to have answered in the online text.	3.70	0.87
27- I check to see if my guesses about the online text are right or wrong.	3.74	0.96
28- When I read online, I guess the meaning of unknown words or phrases.	3.70	0.87
29- I scan the online text to get a basic idea of whether it will serve my purposes before choosing to read.	3.78	0.90
30- I skip words or sections I find difficult or unfamiliar.	2.83	0.93
31- I critically evaluate the online text before choosing to use information I read online.	4.04	0.97
32- I can distinguish between fact and opinion in online texts.	4.04	0.97
33- When reading online, I look for sites that cover both sides of an issue.	3.39	1.03
34- When reading online, I translate from English into Arabic.	3.57	1.19
35- When reading online, I think about information in both English and Arabic.	3.48	1.12
36- When I encounter difficult reading in English, I look up supplementary materials online on the same topic in Arabic.	3.35	1.22

Table 8 above shows that the participants reported using the different online reading strategies as designated in the survey items with varying degrees of frequency. The means of individual strategy items ranged from a high of 4.35 to a low of 2.65.

Correlations between Survey Findings

The third question underpinning this study seeks to tap into the similarities and differences between print reading strategies and online reading strategies. Both surveys were found to be highly correlated on Pearson's Correlation Co-efficient (r = .791). Table 9 below delineates bivariate correlations between both survey findings:

Table 9: Bivariate correlations between both Surveys

		Survey 1	Survey 2
Survey 1	Pearson Correlation	1	.783(**)
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	28.016	20.870
	Covariance	.412	.307
	N	60	60
Survey 2	Pearson Correlation	.783(**)	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	20.870	25.382
	Covariance	.307	.373
	N	30	30

As for the third research question tapping into the effects of the type of environment on college students' reading strategies when they read online compared with conventional print reading, a paired t-test was run on students' mean scores on both surveys, the results of which are summarized below in Tables 10 and 11 below:

M	SD	SEM	95% Confidence Interval of the Difference		*t*	*df*	Sig.
			Lower	Upper			
-.260	.414	.049	-.360	-.161	-5.23	59	.000*

*Two tailed significance p< .01

Table 11: paired Differences between Survey 1 and Survey 2

	M	N	SD	SEM
Survey 1	3.28	60	.644	.081
Survey 2	3.54	30	.663	.078

Results from the tables above indicate that there are statistically significant differences in students' strategy use attributable to the type of reading environment they are in whether it is conventional print or Internet-based.

Assumptively, this study was informed by the hypothesis that highly strategic readers of printed materials would be effective users of reading strategies online. Findings from Survey 2 suggested that the participants were on the average with strategy use (M = 3.64), and they were predisposed to using more problem-solving strategies than the other two categories (M=3.88), but they were also using global strategies more frequently. However, the differences between informants' use of strategies with print materials versus online texts

were not statistically significant. Generally, participants reported using more problem-solving strategies and global reading strategies but they were more strategic readers when they read online, even upon resorting to similar print reading strategies, which disproves the hypothesis underlying this investigation.

For the research question 3 tapping into the effect of environment on college students' reading strategies when they read online compared with conventional print reading, it was hypothesized that more strategic readers with print materials would be as equally strategic with online reading as well. Generally, mean scores on both surveys indicate a statistically significant difference between print readers and online readers to the advantage of online readers who were more strategic when they read online texts. One-way ANOVA results prove the differences were statistically significant.

Effect of Strategy Use on Reading Comprehension

To identify the effect of strategy use on reading comprehension on both print reading and online reading, a reading comprehension test was administered to both groups, the results of which were run on a split-plot ANOVA where the results of both groups in the reading comprehension tests served as the between factor (classified into three categories of low, average and high strategy users) and the two surveys functioned as the within factor. Table 12 below summarizes these findings:

Table 11 – Split-Plot ANOVA – Reading Comprehension and Strategy

Source	*Type III Sum of Squares*		*Df*	*Mean Square*	*F*	*Sig.*
strategy	Sphericity Assumed	1.787	1	1.788	20.234	.000*
	Greenhouse-Geisser	1.787	1.000	1.788	20.234	.000*
	Huynh-Feldt	1.787	1.000	1.788	20.234	.000*
	Lower-bound	1.787	1.000	1.787	20.234	.000*
strategy *	Sphericity Assumed	.001	2	.000	.003	.997
Comprehension						
	Greenhouse-Geisser	.001	2.000	.000	.003	.997
	Huynh-Feldt	.001	2.000	.000	.003	.997
	Lower-bound	.001	2.000	.000	.003	.997
Error(strategy)	Sphericity Assumed	5.828	66	.088		
	Greenhouse-Geisser	5.828	66.000	.088		
	Huynh-Feldt	5.828	66.000	.088		
	Lower-bound	5.828	66.000	.088		

**p<.01*

Results from the split-plot ANOVA test indicate that there is a main effect for strategy use, but there is a statistically insignificant interaction between strategy and comprehension. This result demonstrates that the differences between reading comprehension mean scores for both groups did not affect strategy use in print or online reading environment.

This finding is incongruent with prior research (e.g., Afflerbach, 2000) which suggests that reading comprehension ability may have a significant effect on strategy use; for instance, less-able readers may resort to more strategies like scanning, rereading, previewing, reviewing, looking for details, elaboration, etc. In online environments, they would be more predisposed to scrolling through online texts to and fro more often than not as they may have a problem comprehending a text. More able-readers may not resort to such strategies, but may skim more or preview more; however, the split-plot ANOVA results showed that comparisons between reading comprehension mean scores and mean scores on the two surveys were insignificant, suggesting that comprehension is not a factor of significance with regard to strategy use, irrespective of reading environment or text type.

Concerning the fifth research question tapping into the college readers' perceptions of their reading strategies when they read online texts, six students were chosen to participate in a think-aloud protocol, given their reading comprehension scores and their completion and mean scores of their responses to the two surveys in this research. The six informants in the think-aloud protocol were two low strategic readers, two average strategic readers and two high strategic readers. Each category of two of the six informants served as individual cases, considering their responses to the survey inventories, their mean scores on the reading comprehension test and the qualitative analysis of their responses in the think-aloud protocol. The researcher made sure they represent the three categories of low reading comprehension scores, low survey scores, average reading comprehension scores, average survey scores and high reading comprehension scores and high survey scores, each forming a case study.

Case 1: Ghanem and Ibraheem

Both informants obtained low reading comprehension scores and low survey scores. Both of them experienced some difficulty with strategy use in print and online texts. As they were given a text to read through, both experienced difficulty to fully read the text and they stopped several times to make sense of what they read. They had difficulty skimming the text for its global meaning, as they encountered difficulties scanning or previewing the text for details or specifics. For instance, Ghanem stated, "The text is well written, but I can't know the meanings of some of its vocabulary which causes difficulty for me getting the gist or looking for details". Ibraheem also commented, "I can't get the meaning of this text. It is difficult in structure and many of its words I don't know". Both of the informants indicated that the text being on marine box jellyfish in Australia reminds them of "a National

Geographic episode" or a science text where, according to Ibraheem, "some sentences and words are jargon and make no sense to them, while some vocabulary is highly scientific" and they don't even know the meanings even upon consulting a dictionary. For the other online text they were given, both of them scrolled the text up and down several times, reading and rereading, sometimes resorting to Google or the Online Dictionary to get more information on the words or sentences they did not understand. Ghanem said, "The online text with its hypertext is useful. I can go to the Online Dictionary or to Google Translate to get the meanings of parts of the passage to understand".

Case 2: Fawwaz and Fahad

They were representative of average scorers on the reading comprehension test and the survey inventories. They were reticent and reluctant to participate in the think-aloud procedure, but they finally responded quite interactively. They were given the same print text on marine jellyfish, which they both read slowly, scanning and previewing, stopping after each paragraph, while sometimes, they were note-taking some information from the text or some items they failed to grasp their meanings well. Sometimes, they asked the interviewer during the think-aloud protocol for meanings of sentences or vocabulary; Fawwaz said, "The text looks confusing, but I will try to read it over and again in order to get what it means". Fahad commented, "The text is scientific and the vocabulary is hard to understand or even pronounce". But I am interested in knowing that the box jellyfish is the most dangerous marine killer in the world. This is new to me." They were given the other text online, a reading on the wreckage of Titanic. Overall, both of them read slowly and more strategically as they made use of many of the reading strategies they exhibited on the surveys, like scrolling up and down, checking for extremely difficult vocabulary on online dictionaries, opening links and hypertexts and googling vague or incomplete information for more clarification, etc.

Case 3: Faisal and Abdulillah

These two interviewees were highly strategic readers who scored highly on the reading comprehension test and on the two surveys as indicated by their mean scores.

Both informants felt comfortable and able to complete the interview it its think-aloud protocol. They could read the print and online texts assigned to them more efficiently and more capably. They could summarize, restate, and read aloud the texts with great flexibility and smoothness. Faisal said, "This text on marine box jellyfish is informative and more research-provocative. I've learnt much by reading it". He read fast, could translate, understand, guess new meanings from context, and make necessary connections between paragraphs and the different bits of information in the text. For the online text, Faisal also read it quickly, and could understand most of it, regardless of any unfamiliar vocabulary in the text. They made use of a wide array of strategies while reading the print and the online texts. Abdulillah was also very excited about the interview and the read-aloud procedure, indicating that the texts

at issue were interesting and readable. He was agitated and read avidly the two texts quietly but quickly. While reading, he kept reticent, but his eyes were scanning the text avidly, energetically and enthusiastically.

For the online text, he scrolled it up and down for a quick scan and a preview of the title, mean ideas in paragraphs and the concluding remarks in the concluding paragraph. Abdulillah was not concerned with the difficult or unfamiliar vocabulary, but he could make sense of the entirety of the text as a gestalt. He said in comment about this, "Nope, I don't care a damn about the meanings of individual vocab, but the texts are interesting enough to keep me engaged in reading for meaning. I always read for the overall meaning, not word by word". The responses of these two highly strategic readers remind of Pressley & Afflerbach's (1995) dictum that "good readers not only know what they are doing, but why they are doing it, ever aware of the characteristics of text they are confronting and their own reading goals" (Pressley & Afflerbach, 1995, p.68).

The think-aloud procedure yielded the following findings:

More strategic readers heavily use the strategies of previewing, skimming and scanning. Participants reported that they use more strategies when they read online than when they read print materials, which suggests that reading comprehension ability or print reading strategies were not counter-influencing their reading strategy use online. Perhaps the online environment keeps them more concentrated possibly due to the graphic and hypertextual nature of websites which assists them understand and visualize better what they read. This eventually induces more effective reading comprehension.

More strategic readers preview the texts more frequently, stop after each paragraph and seek answers to text questions or make notes on the text. they rely heavily on their background knowledge, their cognitive and metacognitive strategies and on their expertise with reading. They are adept at setting a goal for their reading, and they adjust their reading speed according to their level of reading comprehension. They can skip bits of the text if they evaluate them as redundant or verbose or less important for overall understanding. They don't get tripped up by unfamiliar lexicon and rely heavily on guesswork and extrapolation using context and their general knowledge about the world (background knowledge) or knowledge about the language (vocabulary and structures). Therefore, they are selective readers, heavily using selective attention strategy more frequently. Less strategic readers get tripped in unknown vocabulary and spend much time in lexical study and dictionary look-ups unnecessarily.

More strategic readers skim for the gist. They make use of interactive reading strategies by manipulating bottom-up processing strategies and top-down processing strategies. They read the text in its entirety unstopped by lexical look-ups or structural difficulties, They consider the whole text as a gestalt and they read through it, making use of their background knowledge and the information in the text to understand the main ideas and the gist. Less strategic

readers wade through the texts with difficulty, however. They reread over and again, or scroll the screen up and down several times. Sometimes, they stop reading for dictionary work or translation into Arabic, which takes up much of their time unnecessarily.

More strategic readers continually read the texts uninterrupted. They are more involved when the reading tasks are challenging or interesting, so they proceed with reading at a rapid pace and in an interactive fashion.

More strategic readers read texts silently and quietly, while less strategic ones read aloud, paying more attention to phonics more than the content and what it makes sense to the readers. Therefore, in the think-aloud protocol activities, informants resorted to reading aloud when they were requested to, but they reported the reading-aloud strategy to be the least effective for them and therefore the least used strategy - a finding consistently resonant with what they reported in the survey inventories where the skill received the lowest mean scores on both surveys.

More strategic readers used the strategy of paraphrasing more than less strategic readers, while the latter resorted to translation either using dictionaries for individual works or Google translate for bits of the texts.

More strategic readers were looking for patterns of meaning in the texts, as much as they were concerned with making connections, reading coherently and looking for main ideas. Less strategic readers were absorbed in the details and specifics, sometimes resorting to rereading redundantly.

Concluding remarks

This study bore out several findings, significantly that reading comprehension strategy use is influenced by the Internet environment more than by the print reading environment. In addition, reading strategy use is not influenced by students reading comprehension ability, but is more affected by strategy use in the online environment. Results also revealed that students were more predisposed to using problem-solving strategies in online settings and global understanding strategies with print materials. These findings are commensurate with findings from the study of O'Malley and Chamot's (1990) which indicated that EFL readers are more involved in using cognitive and metacognitive strategies that aid their reading comprehension.

The study also concluded that informants utilized their background knowledge and schemata activation more when they are online than when they read print texts due to the nature of text format and hypertext in online materials and the linear nature of print texts. This result is consistent with the results from the study of Coiro and Dobler (2007) in which the author concluded that reading comprehension requires readers should activate their prior knowledge sources upon reading online utilizing hypertext, referencing, sourcing and resourcing strategies.

The second most reported strategies used were global understanding strategies such as skimming, scanning, previewing, pausing at paragraphs, or scrolling up and down for locating information. Participants also reported that support strategies were used the least.

The online strategy use may be the result of traditional reading strategy training in print reading classes. These strategies are at the base of their online reading strategy use, however. In the think-aloud protocols, informants indicated that there are supplementary strategies relating to computing skills and online searching skills must also be used to help readers read effectively online.

Implied from this study is the recommendation that EFL readers should be trained on both cognitive and metacognitive reading strategies to be able to read effectively either print materials or online texts. In addition, they should brush up on their current print reading strategies as a baseline strategy instruction and training.

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