Metacognitive Online Reading Strategies Of Science And Technology Students

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ABSTRACT
As technology paves its ways into language classrooms, essentially online reading strategies play an important component for students especially at tertiary level. The goal of this study was to explore student’s online reading strategies when they read hypertext materials designed for academic purposes. A total of 100 students from different Science and Technology courses in a public university in the East Coast of peninsular Malaysia participated in this study. Data was collected through the use of a web-based survey (Survey Monkey) comprising of two main sections; internet usage and Online Survey of Reading Strategies (OSORS). The survey was a 38-item Likert scale type of question measuring metacognitive online reading strategies for academic purposes. The results of the survey revealed that the students employed problem solving strategies (M=3.66) the most with support reading strategies (M=3.29) the least. It can be concluded that the students are able to use higher order thinking skills when dealing with hypertext academic materials. The study implicates that there is a need to teach students the appropriate online reading strategies when they read hypertexts.

Keywords: Online reading strategies; Science and Technology; tertiary level students; hypertext materials; academic purposes.

INTRODUCTION
With the increase development of technology and the massive use of the internet, L2 readers now acquire knowledge via the internet. This form of acquiring knowledge is intended to support learning in order to provide educational advancements for students (Nor Fariza Mohd Nor, Hazita Azman, & Afendi Hamat, 2013) especially at tertiary level. Students will be required to read for long hours on the internet for many purposes. This increase of reading online has developed a new style of reading from the traditional left-to-right to the non-linear way of reading, often jumping to different parts of hypertexts. Akyel and Erçetin (2009) assert that hypertext refers to information presented in a nonlinear manner where the presentation order is not fixed allowing the reader to have control of the reading process.

Studies on online reading is becoming more and more common because of increase in the need to read online. However, not many are aware that online reading requires certain strategies in order to comprehend a more complex form of reading. Herold (2014) claims that online reading is usually related to solving a problem, while offline reading is geared towards reading for pleasure. Therefore, students should be well-versed in communicating in multiple modalities. This form of online reading is increasing dramatically and is often linked to the ability to navigate between hypertexts with the use of proper reading strategies. In view of this, this study aims to identify students’ online reading strategies for academic purposes. This paper describes students’ usage of the internet and reported use of online reading strategies. In order to achieve these aims, this study addresses the following research questions:
1. What is the usage of internet written in English among the learners?
2. What are the online reading strategies that students use the most in reading hypertexts for academic purposes?

In addition, the many focus of online reading studies is cornered towards online reading strategies because it is seen as a needed skill that L2 readers need to acquire in order to be able to synthesize, evaluate and comprehend hypertexts.

**LITERATURE REVIEW**

Online reading is viewed as a complex process that requires the act of deciphering letters or words on hypertexts. According to Yao-Ting, Ming-Da, Chun-Kuang, and Kuo-En (2015), online reading has shifted from the traditional form of reading newspapers, books or magazines to reading non-traditional media such as online reading of different forms of information like videos, hyperlinks and sounds. It is also known as “hypertextual’ form of reading comprising of nodes and hyperlinks that represents concepts or ideas. These concepts or ideas are information presented in a non-linear order, allowing readers to read in any order they prefer.

Although online reading and offline reading may be similar in a few aspects, according to Coiro and Dobler (2007), there are also some differences. For example, hypertexts that contain a lot of hyperlinks require the readers to decide what to read rather than reading according to the layout by the author. Moreover, hypertexts do not have clear textual context so readers need to decide the relationship between the links (Yang (1997) and Balcytiene (1999) as cited in Yao-Ting et al. (2015)) for themselves. In general, however, hypertexts are non-linear and do not follow a specific order of reading, where readers merely read in a less linear manner transferring offline reading strategies to online reading.

In addition, Coiro and Dobler (2007) postulate that online reading also takes into account reader’s background knowledge, making inferences and evaluating relevance of online information. This process also requires tapping into the readers’ prior knowledge in order to make meaning of the hypertexts. Readers will try to make connections with what is read to what background knowledge they have. Thus, comprehension is achieved based on the hypertext read and with prior knowledge (Nor Fazlin Mohd, Saadiyah, & Nadzrah Abu, 2011). However, prior knowledge is not the only factor to achieve comprehension. There is a need for readers to apply online reading strategies in order to achieve comprehension.

There are two major categories of reading, which are cognitive and metacognitive reading strategies. Cognitive strategies refer to strategies that aid the readers in constructing meaning of the texts, whereas metacognitive strategies are strategies that regulate cognitive strategies (Devine, Carrell, & Eskey, 1987). Research on online reading strategies has identified metacognitive reading strategies as strategies that will allow learners to overcome problems while reading. This is because it is believed that metacognitive strategies will assist readers to ultimately achieve reading comprehension. According to Anderson (2003) as cited in Nor Fazlin Mohd et al. (2011), research into metacognitive strategies has classified these strategies as below:

1. Global strategies – where readers plan their reading by previewing the text or having a purpose in mind.
2. Problem-solving strategies – where readers use actions in order to understand a text by guessing the meaning of words or rereading it.
3. Support strategies – where readers use aids to assist in reading such as online dictionaries or highlighting.
These subcategories are based on Online Survey of Reading Strategies (OSORS) that was developed by Anderson (2003) in order to measure students’ metacognitive reading strategies in reading hypertexts for academic purposes. Based on his survey using OSORS he believes that online reading abilities of L2 readers can be promoted through the strategies outlined in OSORS. More importantly, recent studies on reading strategies have shown that learners use different strategies depending on their level of proficiency (Ostovar-Namaghi & Noghabi, 2014).

METHODOLOGY

The focus of the study was to understand the online reading strategies that Science and Technology students reportedly use when reading hypertexts for academic purposes. It was also intended to see the usage of internet in English among the participants. The study was conducted at an undergraduate level in a public university, where data was collected quantitatively.

Participants

The sample of this study consisted of 100 students undertaking various undergraduate Science and Technology courses in a public university in the East Coast of peninsular Malaysia. Students were selected randomly but were all taking either one of the four compulsory English subjects for undergraduate students at the university for academic year 2015/2016. The core compulsory subjects at the university are Fundamentals of English (Level 1), English for Academic Communication (Level 2), English for Technical Communication (Level 3) and English for Professional Communication (Level 4).

Instrument

Data was collected quantitatively through the use of a web-based survey named Survey Monkey. The respondents answered questions that were divided into two parts which were the demographic profile and statements which required answers chosen based on likert-scale. The demographic profile was to gain the general demographic of the students and to also establish the students’ usage of the internet in English, while the likert-scale type of question was a 38-item likert-scale type of question named Online Survey of Reading Strategies (OSORS) adapted by Anderson (2003) that measures metacognitive online reading strategies of hypertexts for academic purposes. The survey consisted of statements from always (5) to never (1). The statements were categorized according to three metacognitive reading strategies; global reading strategies (18 items), problem solving strategies (11 items) and support reading strategies (9 items). Anderson (2003) also reported that the alpha Cronbach for the overall OSORS is 0.92 and the reliabilities for the sub-sections are Global Reading Strategies, Problem Solving Strategies and Support Strategies are 0.77, 0.64 and 0.69 respectively.

RESULTS AND DISCUSSIONS

Data was analyzed descriptively in order to determine the usage of internet in English and to identify which strategies were mostly used in reading hypertexts for academic purposes.

Usage of internet

Data was gathered among undergraduate students (n=100) studying various Science and Technology courses. In total there were more male respondents (68%) compared to female respondents (32%). This is probably because the university is listed under the Malaysian Technical University Network (MTUN), which consists of more ‘male dominating’ courses such as various Engineering courses. One of the questions that were asked in the survey is related to how long students have used the internet written in
English. The highest response received (46%) stated that they had used the internet written in English for more than 6 years and surprisingly 23% of respondents have used it for 2-4 years. Table 1 is a summary for the length of time (from months to years) respondents have used the internet written in English.

<table>
<thead>
<tr>
<th>Answer choices</th>
<th>Responses</th>
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<tbody>
<tr>
<td>1-3 months</td>
<td>6</td>
</tr>
<tr>
<td>4-6 months</td>
<td>8</td>
</tr>
<tr>
<td>7-9 months</td>
<td>2</td>
</tr>
<tr>
<td>10-12 months</td>
<td>3</td>
</tr>
<tr>
<td>2-4 years</td>
<td>23</td>
</tr>
<tr>
<td>5-6 years</td>
<td>12</td>
</tr>
<tr>
<td>More than 6 years</td>
<td>46</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
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In addition, 43% of respondents stated that they spend 1-3 hours per day using the internet written in English while 30% uses 4-6 hours per day. This indicates that students do not use the internet solely written in English. They may also allocate some hours reading online in their own mother tongue. Figure 1 indicates the amount of time respondents spent on using the internet written in English per day.

Online Survey of Reading Strategies
The second half of the online survey was based on the responses from OSORS. Descriptive statistics was used to describe the metacognitive reading strategies students use when reading English academic hypertexts. The OSORS was classified into three parts which are Problem Solving Strategies, Global Reading Strategies and Support Reading Strategies. Results for each of the sub parts are described in the following sections. The mean and standard deviations for the three parts of OSORS are listed in table 2.

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Mean, $\bar{x}$</th>
<th>Standard Deviation, SD</th>
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<tbody>
<tr>
<td>Problem Solving</td>
<td>3.66</td>
<td>0.8918</td>
</tr>
<tr>
<td>Global Reading</td>
<td>3.34</td>
<td>0.9384</td>
</tr>
<tr>
<td>Support Reading</td>
<td>3.29</td>
<td>1.0578</td>
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Results obtained proved that the most used strategies are Problem Solving Strategies with the mean of 3.66, followed by Global Reading Strategies and Support Reading Strategies with the least mean of 3.29. This finding is consistent with a study reported by Pookcharoen (2009), where they found that both proficient and less proficient readers used problem solving strategies the most among a group of Thai EFL learners.

Problem solving strategies

Under problem solving strategies, the three most frequent strategies used were P11 (I try to get back on track when I lose concentration), P28 (When online text becomes difficult, I re-read it to increase my understanding) and P16 (When online text becomes difficult, I pay closer attention to what I am reading) with the mean score = 4.06, 4.03 and 4.00 respectively. For P11, out of 100 respondents, 43% answered “4” usually and 33% answered “5” always. This suggests that a total of 76 students chose to read their texts slowly to ensure that they are on track when they are reading hypertexts in order for them to understand the texts they read. The second highest strategy number P28, with a total of 41% answered “4” usually and 32% answered “5” always equating to a total of 73 students that will re-read an online text which is difficult in order to comprehend it. While the third highest statement under problem solving strategies was P16, shows that students concentrate on their hypertexts when the text is difficult. Figure 2 shows the most strategies used under problem solving strategies in percentages.

Global reading strategies

The highest mean score for global reading strategies was for strategy number G5 (I think about what I know to help me understand what I read online) with 3.82, followed by strategy number G26 (I check my understanding when I come across new information) with a mean score of 3.69 and 3.67 for strategy number G6 (I take an overall view of the online text to see what it is about before reading it). Based on global reading strategy number G5, 66% agree to think about what they know to help them understand what they read online. This shows that background knowledge plays a significant role in online reading comprehension. With 46% answering “4” usually and 17% “5” always for strategy number G26, clearly shows that respondents are aware of their reading process and are able to check their understanding of what they are reading online. In addition, more than half (57%) of the respondents take an overall view of the online text to see what it is about before reading it. Figure 3 depicts the most strategies used under global reading strategies in percentages.
Support strategies

The three most frequent used strategies under support strategies were strategies number S15 (I use reference materials (e.g. an online dictionary) to help me understand what I read online), S38 (When reading online, I think about information in both English and my mother tongue) and S21 (I paraphrase (restate ideas in my own words) to better understand what I read online). The lowest among the three most used support strategies is strategy S21 with 34 respondents answering usually and 15 always indicated that students are able to be critical of their reading by thinking about what they read in their own words. Strategy number S38, received the second most mean, $= 3.48$ among the three most used support reading strategies, while strategy number S15 gave the highest mean, $= 3.84$. Strategy number S15 indicates that respondents use reference materials to guide them in understanding the text they read with 62 respondents stating that they usually and always do this. Figure 4 shows the most strategies used under support strategies in percentages.

In conclusion, results indicated that respondent’s perceived problem solving strategies to be more useful than global and support strategies. This is because the need to use higher order thinking skills where reading academic hypertexts, such as English for Specific Purposes (ESP) materials, is concerned. However, the data also revealed that the metacognitive online reading strategies chosen are interrelated and led to one objective that is to improve their understanding towards the text they read online, especially ESL students who are reading ESP at a higher level. Based on the statements selected by the students, it is believed that there is a need to apply these strategies in hypertexts at tertiary level.
DISCUSSION

Results obtained indicated that the undergraduate students employed reading strategies when they read online for academic purposes. The most popular type of reported reading strategy used is problem solving strategies. This implies that the students focused on online reading to gain understanding about the text they read. The findings of this study are consistent with a study among a group of 57 students in a tertiary level institution in Malaysia. The study found students used problem solving strategies the most in reading an English text in order to understand what they read (Hamdan, Abdul Ghaffar, & Sihes, 2010). They put more attention to the difficult texts and re-read it to increase their understanding. This is further supported by a study that found similar results, where problem solving strategies were used the most by Thai EFL students (Pookcharoen, 2009). Pookcharoen (ibid) study proves that the learners are able to control their reading by focusing on the hypertexts read and to solve problems when faced with difficult hypertexts.

The second most frequent used strategy is global reading strategies. This implies that readers have one objective when reading online, which is to have an overview of their reading by properly planning their reading. Here, they are able to plan their reading by previewing the text and getting an overall view of the text. Based on the statements students selected also shows that they use their prior knowledge in order to understand the text. This is similar to study that found students to use their background knowledge frequently when they read online (Coiro & Dobler, 2007). According to Nor Fazlin Mohd et al. (2011), global reading strategies are favored because leaners need to have a purpose when reading hypertexts. Similarly, studies found that global strategies are used more than problem-solving and support strategies (INceÇAy, 2013; Ostovar-Namaghi & Noghabi, 2014). A low score on the use of global and support reading strategies suggest that the types of strategies in these subscales require the students to think over while they read online texts (Vilhelmina & Daiva, 2013). However, the least used strategy is support reading strategies where the three most items selected have the same keyword; understand. This shows that students have a preference in using reference materials in order to help them understand the hypertexts. They are also able to restate the hypertexts in their own words in order to understand what is read and are more inclined to think about the hypertexts in both English and their mother tongue.

CONCLUSIONS

The purpose of the present study was to explore the usage of the internet written in English and reported online reading strategies of students in tertiary level. Results indicated that respondent’s perceived problem solving strategies to be more useful than global and support strategies. This study revealed that the metacognitive online reading strategies chosen are interrelated and led to one objective that is to improve their understanding towards the text they read online. Moreover, the data suggests that there is a need for students to use metacognitive strategies to enhance their academic reading process.

Traditional reading and online reading are clearly different, which implies the need to train tertiary level students how to read online (Afendi Hamat, Nor Fariza Mohd Nor, Hazita Azman, Nadzrah Abu Bakar, & Noorizah Mohd Noor, 2010). Future studies need to explore how such awareness of metacognitive reading strategies would assist in reading online, especially at tertiary level, where students are consistently required to read English texts which are of a higher degree of difficulty. Therefore, in order to achieve reading goals, there is a need to teach students appropriate online reading strategies and navigation skills (Wu, 2014) in order to equip students in the new 21st century of learning and teaching.
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