

An exploratory study of NNES graduate students' reading comprehension of English journal articles

Kate Tzu-Ching Chen
Chaoyang University of Technology
Taiwan

Abstract

The academic success of non-native English speaker (NNES) graduate students greatly relies on their ability to read and comprehend English journal articles (EJA). The purpose of this study was to identify NNES graduate students' comprehension difficulties and reading strategies when reading EJA. In addition, the study explored how the relationship between reading difficulties and reading strategies are characterized. The study participants were 456 graduate students undertaking various majors in Taiwan. Both survey and interview methods were employed. The results of the study revealed that the participating students had medium-to-high levels of reading comprehension difficulties and that they tried to use various reading strategies. There is a significantly negative correlation between EJA reading difficulties and reading strategies.

Keywords: English journal articles (EJA); non-native English speaker (NNES) graduate students; reading comprehension difficulties; reading comprehension strategies; Taiwan

Over the past few decades, the ability to read English as a second language effectively has attracted increasingly more attention from many scholars. As a result, considerable research has been conducted into the awareness of the reading process and the effective reading strategies of learners from a wide range of demographics, such as gender, age, proficiency levels, nationality and first language (Alsheikh & Mokhtari, 2011; Anderson, 1991; Block, 1986; Brantmeier, 2002; Malcolm, 2009; Matsumoto, Hiromori, & Nakayama, 2013; Mokhtari & Reichard, 2002; Mokhtari & Sheorey, 2008; Oxford, 1990; Plakans, 2009). However, little attention has been given to reading strategies used for English journal articles (EJA), an issue that non-native English-speaking (NNES) graduates have to address as they need to tackle a wide range of reading for their academic majors. In order to remain aware of the current issues as well as the latest research in their fields of study, graduates need to quickly learn how to filter and read articles published in academic and professional journals. However, in NNES countries, the academic success of graduate students greatly relies on their abilities and proficiency in English, aspects which are important in order to gain knowledge and skills in research (Murray & Hughes, 2008).

Being able to fully understand EJA is a challenge for many NNES graduates. Therefore, it is important for NNES learners to recognize that reading strategies can be used to facilitate

comprehension; this is especially important as research results have indicated that most learners do not recognize the strategies they use during the reading process and that they do not take advantage of all available strategies (Oxford & Crookall, 1989). Participants whose reading difficulties and strategies are investigated in this study reported they had received minimal reading instruction and had limited reading experience of EJA before entering their graduate program. In order to gain an understanding of how they cope in this situation, this study examined their reading comprehension difficulties and the extent of their awareness of EJA reading strategies, together with the relationship between these two factors. The study data gathered from the graduate students participating in this research was used to establish a list of reading comprehension difficulties and reading strategies in regard to EJA. This study addressed the following research questions:

- What are the EJA reading comprehension difficulties of NNES graduate students in Taiwan?
- What is the frequency that NNES graduate students employ EJA reading strategies?
- Is there any relationship between EJA reading comprehension difficulties and the usage of EJA reading strategies?
- What are the NNES graduate students' perceptions regarding their use of reading strategies when reading EJA?

Literature Review

Reading comprehension difficulties of EJA

Students who enter into a graduate degree do so with reading and writing abilities that are at an undergraduate level and thus have trouble comprehending the more technical and advanced written English journal articles (Paltridge & Starfield, 2007). The reading of EJA involves not only relevant English reading ability, but also what Dressen-Hammouda (2008) describes as “a wide range of specialist knowledge frames” (p. 233). As Cheng (2008) suggests, the genre of learning contributes significantly to students' awareness of the rhetorical form and academic format of research articles. In this study, reading comprehension difficulty refers to the problem of understanding the context of an article being read due to the limited language abilities of the reader, and/or the complexity of the language in the content of the article. It does not refer to the situation in which a reader displays difficulty in reading as a result of neurological or physical factors. Factors that contribute to reading comprehension difficulties include the lack of sufficient prior knowledge, limited vocabulary, a lack of sufficient syntactic knowledge, limited semantic knowledge and language proficiency, short attention span, memory failure, low interest in reading, and the inability to use effective reading strategies (Perfetti, Marroni, & Foltz, 1996). Other barriers include insufficient knowledge of English vocabulary, limited memory span, problems with understanding the main points and evidence, and the lack of prior knowledge of the subject. Of these above-mentioned barriers, limited vocabulary and memory failure are the most prevalent. Furthermore, the breadth of the reader's vocabulary is an important indicator for reading comprehension, a factor which relies heavily on memory (DeSoto & DeSoto, 1983).

The factors that influence the reading comprehension of EJA are scarce as the literature on this

subject is limited. However, factors that influence reading comprehension in general have been articulated as follows (National Reading Panel, 2000; Wiederholt & Bryant, 1987):

- Contextual factors: text features, text structure, readability, language complexity, etc.
- Reader factors: background knowledge, vocabulary, fluency, comprehension strategies, comprehension skills, motivation, memory span, attention span, intelligence, physical status, cultural background, etc.
- Environmental factors: instructor's teaching strategies, learning environment, learning atmosphere, etc.

Related research on EJA reading strategies

Many graduates simply attempt to read an EJA as if it were a newspaper article or a short story, by reading it from the beginning through to the end (Holmes, n.d.). They ignore the fact that journal articles are written by researchers for the specific purpose of supporting scholarly communication and delivering new information, not for general information and the entertainment of a broad audience (Campbell, 2002). In other words, graduates need to be aware of the format and writing style of a journal article in order to facilitate their reading comprehension, and this may require specific instruction or training of reading strategies. Reading strategies are defined as "the mental operations involved when readers purposefully approach a text and make sense of what they read" (Barnett, 1988, p. 68). The promotion of English reading strategies began in the 1960s due to a substantial increase in the number of international college students visiting America who desperately needed to improve their ability to understand, speak, and write academic English. In the 1970s, English reading strategies received a considerable amount of attention from researchers investigating learners' reading comprehension, before becoming the main focus of English reading research in the 1980s (Grabe, 1991). Since then, many studies on English reading have contributed to the understanding of learners' reading processes and their usage of various strategies to enhance reading comprehension in efficient and effective ways (Brantmeier, 2002; Kim, Wang, Ahn, & Bong, 2015; Lee, 2015; O'Malley & Chamot, 1990; Oxford, 1990; Zhong, 2015).

NNES graduate students with limited English proficiency might attempt to translate an EJA from English into their native language in order to fully understand the text. However, in doing so, there is a risk that they may misinterpret the content due to, for example, translation errors and cultural differences. In fact, the difficulties faced by NNES readers when reading an EJA are not necessarily due to their insufficient English proficiency but to academic readiness. NNES graduate students with no prior experience often have misconceptions about the nature of research. They need to learn and use reading strategies that are specifically targeted at EJA, such as scanning the paper to determine the context, making predictions, noting the identified main points, and summarizing while reading (Shaw, 1991). Once students become familiar with the unique writing style of an EJA, then their reading speed and comprehension will improve. It is suggested by Almasi and Fullerton (2012) that graduate students should start by reading the title and abstract carefully in order to grasp the basic argument the author is trying to make before starting to read the whole article.

As a consequence of this attention, many English learning strategies have been identified and

classified by different researchers. Goodman (1970) divided English reading strategies into two process types, namely bottom-up and top-down. Bottom-up strategies involve the recognition of a multiplicity of linguistic signals, such as letters, morphemes, syllables, words, phrases, grammatical cues, and discourse markers, and the application of a linguistic data-processing mechanism to impose order on these signals. Top-down strategies involve the reader using their intelligence and experience to understand a text through a puzzle-solving process, or referring to the meaning to decide what to retain and what to discard. Barnett (1988) further stated that second language reading strategies involve skim reading, scanning, guessing and evaluating those guesses, separating the main ideas from the supporting ideas, recognizing cognates and word families, reading for meaning, predicting, activating general knowledge, making inferences and predicting the word meanings from the context.

Sheorey and Mokhtari (2001) divided English reading strategies into three categories: metacognitive, cognitive, and supportive. Metacognitive strategies are the intentional and carefully planned techniques used by learners to monitor or manage their reading. Cognitive strategies are those where readers use certain actions and procedures while they work directly with the text. Support strategies are where the readers use tools to comprehend the text, such as a dictionary, taking notes, or underlining or highlighting the text. Mokhtari and Reichard (2002) further classified these English reading strategies to include global reading strategies (GLOB), problem-solving strategies (PROB), and support strategies (SUP). GLOB are strategies that are intentional and carefully planned by students to monitor their reading, such as setting out the purpose for reading, activating prior knowledge, checking whether the content of the text fits the purpose, and predicting what the text is about. PROB strategies are actions employed by the readers when interacting with the text directly, and even more so when challenging text is encountered. These strategies include reading slowly and carefully, adjusting the reading rate, reading text aloud, and guessing the meaning of unknown words. SUP strategies are used by the readers to aid their comprehension, such as visualizing the information read, reading text aloud, and guessing the meaning of unknown words. In addition, Duke and Pearson (2002) proposed six second language and foreign language reading strategies: prediction or prior knowledge, using think-aloud strategies to monitor comprehension, using text structures, visual models (e.g., graphic organizers and imagery), summarizing, and raising and answering questions whilst reading.

Many pioneering researchers have devoted their careers to the issues surrounding the writing of research papers and theses or dissertations (e.g., Bitchener & Basturkmen, 2006; Paltridge, 2002; Samraj, 2008). However, little research has investigated the awareness and usage of EJA reading strategies. Rosenshine (1980) proposed seven potential reading strategies for EJA. These were “recognizing sequences, recognizing words in context, identifying the main idea, decoding the details, drawing inferences, recognizing the cause and effect, and comparing and contrasting” (p. 540). McNeal (1989) suggested the use of four steps when reading research articles that can be modified to fit the EJA reading as follows:

- Skimming: skim read the paper quickly while noting the basics, such as headings and figures.
- Vocabulary: read through the paper word by word and highlight every word and phrase that is not understood.

- Comprehension of each section in turn: most articles follow a standard format that conforms to the guidelines established by the American Psychological Association (APA). These include the abstract, introduction, literature review, methods, results, and conclusion.
- Reflection and criticism: after reading the article, ask whether the author's arguments make sense. Is the article internally consistent and is it well supported by the arguments and evidence?

Method

This study focused on the reading comprehension of EJA and was developed on the basis of English language learning theories (e.g., Duke & Pearson, 2002; Mokhtari & Sheorey, 2008; O'Malley & Chamot, 1990; Sheorey & Mokhtari, 2001). In this study, a mixed method design was used. Within the quantitative section of this study, NNES graduate students were surveyed on their EJA reading difficulties and the strategies they used. Within the qualitative section of this study, the main technique used to collect data was semi-structured interviews. Then, within the conclusion section, both the quantitative and qualitative results are integrated and discussed.

Participants

The participants in this study were 456 students enrolled in a variety of master's degree programs at 11 universities across Taiwan. All the participating graduate students had completed at least eight years of English education and had graduated from undergraduate programs prior to their enrollment in their respective master's program. 72.3% of the students were men and 27.7% of them were women; 75.7% were under 25 years old. In the second part of the study, the interview samples were randomly selected from survey respondents who volunteered for the interviews; they consisted of 20 graduate students (12 males and 8 females) from various universities in Taiwan. Face-to-face or telephone interviews were conducted depending on participants' preferences.

Measures

A survey was developed using the following steps: (a) related studies, books, and references were reviewed, particularly *The Survey of Reading Strategy* (SORS) by Mokhtari and Reichard (2002); (b) 20 graduate students were interviewed; (c) a pool of 120-items was created; (d) the repeated items were then discarded; (e) each item was reviewed and reduced by the researcher; and, (f) opinions from experts were sought to ensure the content validity of the survey. A total of six university professors in related fields were asked to check the survey for common errors like double-barreled, confusing, and/or leading questions.

The survey with 50 items (see Appendix A) was then pilot-tested on 50 graduate students. The reliability analysis revealed a Cronbach's alpha reliability score of .85 for the reading comprehension difficulty section and a score of .90 for the reading strategy section, demonstrating that the survey was highly reliable. The validity analysis revealed the Kaiser-Meyer-Olkin validity of .85 for the reading comprehension difficulty section and a score of .79

for the reading strategy section, demonstrating that the validity of the survey was high. Therefore, the reliability and validity of the study instrument were warranted.

As a result, the first part of the formal survey included 15 five-point Likert scale questions through which students rated their EJA reading comprehension difficulties from 'strongly agree' to 'strongly disagree.' The second part of the survey used 35 Likert scale questions from 'never or almost never' to 'always or almost always' in order to measure the three categories of English reading strategy, namely, global reading strategies (GLOB), problem-solving strategies (PROB), and support strategies (SUP). The last section of the survey asked for the participants' personal information. The survey was then given to the graduate students by their course instructors at their respective universities. The participants were asked to answer the questionnaires under the situation of reading EJA that is related to their coursework or to their thesis writing.

In the qualitative part of the study, semi-structured interviews were used to learn more about the reading comprehension difficulties faced by graduate students when reading EJA as well as their perceptions of the EJA reading strategies mentioned in the survey. Guided primary questions were asked to explore each participant's individual perspective and secondary questions were asked to obtain more depth and detail.

Data analysis

To begin the data analysis, descriptive statistics were completed to show the mean and standard deviation of the completed responses. If a difficulty was rated as 'agree' ($M=3.40\sim4.19$) or 'strongly agree' ($M=4.20\sim5.00$), it was interpreted as a high level of difficulty. Accordingly, an item was considered as being frequently used strategy if it was rated as 'usually' ($M=3.40\sim4.19$) or 'always or almost always' ($M=4.20\sim5.00$). The Pearson correlation coefficient was used to determine whether EJA reading comprehension difficulties and the use of EJA reading strategies were related. Following on from this, the results of the semi-structured interviews were analyzed using the content analysis method. All interviews were subsequently evaluated and the data grouped into categories. A further classification then separated these categories into sub-categories as well as emerging themes and issues. As a result, three major themes in the data became apparent: NNES graduate students' comprehension difficulties, reading strategies, and reading experiences of EJA.

Results

Quantitative results

The results of the quantitative analyses of answers from the first three research questions of the study are discussed in this section. As can be seen from Table 1, the participants were asked to identify the reading comprehension difficulties encountered when reading EJA. Reading comprehension difficulties were ranked with only the top six items identified as having a high level of difficulty. Limited vocabulary ($M=3.90$) was reported as the top reading comprehension difficulty, followed by low reading speed ($M=3.62$). The overall level of reading comprehension difficulties was medium to high ($M=3.28$).

Table 1. *The means and standard deviations of EJA reading comprehension difficulties*

| Difficulties | <i>M</i> | <i>SD</i> |
|--|----------|-----------|
| Limited vocabulary | 3.90 | .979 |
| Low reading speed | 3.62 | 1.027 |
| Limited semantic knowledge (professional terms) | 3.56 | 1.022 |
| Lack of reading efficiency | 3.51 | 1.035 |
| Lack of syntactic knowledge | 3.42 | 1.060 |
| Short attention span | 3.35 | 1.065 |
| Unfamiliarity with the organization of the journal article | 3.24 | 1.086 |
| Lack of sufficient prior knowledge | 3.19 | 1.012 |
| Inability to use effective reading strategies | 3.16 | .984 |
| Limited interest in reading | 3.12 | 1.014 |
| Lack of patience | 3.12 | 1.027 |
| Memory failure | 3.11 | 1.031 |
| Do not know where to start reading | 2.96 | 1.077 |
| Having a problem understanding the main points | 2.92 | 1.029 |
| Do not understand the tables, charts or statistics | 2.91 | 1.072 |
| Total | 3.28 | 0.680 |

In Table 2, the participants reported that they 'usually' used 29 of the 35 reading strategies. In addition, five strategies were employed only 'sometimes' ($M=2.6\sim 3.39$) with just one strategy employed 'only occasionally.' As suggested by Oxford (1990), with regards to language learning strategy usage, a high (a mean of 3.5 or higher), medium (a mean of 2.5 to 3.4), or low score (a mean of 2.4 or lower) indicates that reading strategies ($M=3.53$) were frequently used by the NNES graduate students when reading EJA. Furthermore, the mean score for each strategy category was also provided. These indicated that graduate students have a higher usage of global reading strategies ($M=3.68$) than the problem solving ($M=3.49$) and support strategies ($M=3.39$). The overall usage of reading comprehension strategies was high ($M=3.54$).

Table 2. *Means and standard deviations of EJA reading strategies*

| Strategies | <i>M</i> | <i>SD</i> |
|------------|----------|-----------|
| GLOB | 3.68 | .550 |
| PROB | 3.49 | .551 |
| SUP | 3.39 | .557 |
| Total | 3.54 | .504 |

* $P < 0.05$.

According to Table 3, the results of the Pearson product-moment correlation coefficient showed that graduate students' EJA reading comprehension difficulties have a statistically significant negative correlation with all three reading strategy categories. This indicates that the more frequent the use of reading strategies, the lower the difficulty level when reading EJA.

Table 3. *The Pearson product-moment correlation coefficient results for EJA reading comprehension difficulties, and the subcategory of strategies*

| | GLOB | PROB | SUP |
|------------|---------|---------|--------|
| Difficulty | -.221** | -.198** | -.114* |

* $p < 0.05$; ** $p < 0.01$.

In order to look closely at the relationship between the EJA reading comprehension difficulties and strategy uses, the Pearson product-moment correlation coefficient was performed to further analyze each item of EJA reading comprehension strategies in relation to the individual reading comprehension difficulty item as showed in Appendix B. The results indicated that strategy items in the categories of GLOB have more significantly negative correlations with the difficulty items. For example, GLOB 14 "I use silent reading techniques for rapid processing" and GLOB 16 "I read a sufficient number of EJAs" both are negatively and significantly related to 12 out of 15 reading difficulty items. Furthermore, some reading difficulty items have significantly negative correlations with most of the reading strategy items; for example, difficulty item 15 "Do not understand the tables, charts or statistics" is negatively and significantly related to 29 out of 35 items of reading comprehension strategies. This helped to identify the reading difficulties that are related to specific reading strategies and the vice versa. It is evident that there are many difficulties that graduate students experience while reading EJA and limited space herein does not allow a full examination of the numerous correlations.

Qualitative results

The qualitative analysis of the data gathered during the semi-structured interviews with 20 graduate students is reported to answer the last research question in this section of the study.

NNES graduate students' EJA reading experiences. When the NNES graduate students were asked about their first EJA reading experience, most of them stated that EJA were unexpectedly difficult to read and were far beyond their reading skills. One graduate student from the Department of English stated, "I can almost always easily understand what I read. I developed these skills through constant exposure to all kinds of reading. However, it came as a surprise that an EJA would be so different and difficult to read." Some of the interviewed graduate students indicated that a good reader should have a predefined purpose in mind before starting to read an EJA. Furthermore, one should always read an EJA both for learning and to advance ones reading skills. Many of the graduate students also believed that it was very important to develop good reading habits during their master's studies. A female student from the Department of Electronical Engineering stated, "I am not a good reader of EJA, maybe because I do not have good reading habits or for other reasons. I only read an EJA when I have to. It would be great if I knew more about my reading comprehension difficulties and how to effectively use reading strategies." Another student from the same department also stated, "I have always waited for my professors to encourage and push me to read. I have never made any active efforts to develop my EJA reading skills."

NNES graduate students' EJA comprehension difficulties. All participating graduate students stated that they had encountered comprehension difficulties when reading EJA. Many mentioned that the way English is usually taught and learned as a foreign language is not useful when reading EJA. Consequently, this makes the EJA text very hard to understand, especially when EJA are written in a concise way and to a specific audience who are professionals in the field. One student from the Department of Getronics Technology and Service Management stated, "It is very hard to locate the information I need because of the unique writing style and format of the EJA." Students said that they have tried to use some strategies when read EJA, but when they

failed to understand the context of EJA, most of them gave up reading. They believed the reason for giving up reading is the lack of EJA reading strategies training since they often struggled with which ones to use.

Some of them also expressed the fact that, as graduate students, they did not have time to read every EJA thoroughly since many have to be read over a short period of time. Proper training is needed to help develop an effective reading style. There were a variety of reasons given by graduate students as to why they were unable to understand the text of EJAs. A male graduate student from the Department of Mechanical Engineering stated, "In the past my English teachers did not do their job properly. They should have taught me reading strategies so that I can learn how to read English on my own." Other students blamed themselves for not reading enough journal articles in order to become familiar with the specific writing style. Other reasons included limited vocabulary, low reading speed, unfamiliarity with terms in their academic fields, and the fact that statistics are difficult to understand.

NNES graduate students' EJA reading strategies. Graduate students stated that they tried to use a variety of strategies and some of the most frequently used were note-taking, underlining, summarizing, and re-reading. A female graduate student enrolled in the Department of English mentioned, "I try to take notes to help retain the information I read in EJA. I prefer handwritten notes as I can do these anywhere I want and can then sort, reorganize and then type them on my computer." Five other graduate students also stated that their preferred reading strategies were using prior knowledge, skimming and scanning, paying attention to statistics, reading from other sources, and ascertaining the main points. In addition, graduate students thought that EJA were really difficult to read at the beginning of a study course and that special reading strategies were necessary to improve their reading comprehension.

The interview results also revealed that most graduate students are not required to take courses on how to read EJA effectively in their graduate studies. Many students also stated that they had never taken academic reading or related courses while completing their undergraduate degree. Furthermore, a male graduate student from the Department of English indicated, "There is no course provided by my university to develop my reading skills. In related courses, I was only taught how to write a thesis, never about how to read EJA." One student from the Department of Material Science stated, "I wish that at least one course on reading EJA was offered by the department to help facilitate my EJA reading comprehension." In fact, the majority of graduate students agreed that it would be more beneficial for a master's program to have at least one course on EJA reading strategies.

This last point was a common theme that emerged from the qualitative data; that is, the need by graduate students to have a specific course that would teach them reading strategies for EJA. As the graduate students do not have prior knowledge about EJA reading strategies, they would often hit a stumbling block when they encounter problems. This may be one of the reasons why there are so many correlations found. Thus, even after recognizing numerous strategies that can be used for EJA reading, using appropriate strategies for any given situation appears to be a common problem.

Conclusion, Discussion and Implication

Conclusion

The main purpose of this study was to examine NNES graduate students' reading comprehension difficulties and the strategies they used when reading an EJA. The results revealed that NNES graduate students' have a medium-to-high level of EJA reading comprehension difficulty. These difficulties consist of limited vocabulary, low reading speed, limited semantic knowledge, lack of reading efficiency, lack of syntactic knowledge, and short attention span. The results also indicated a frequent use of strategies while reading an EJA (the mean of the overall reading strategy use is 3.53) among the participants. Of the three sub-categories, GLOB is the most frequently used strategy, followed by PROB and SUP strategies. Despite the above mentioned results, students conveyed the limited scope for EJA strategy usage, such as note-taking, underlining, and re-reading.

There is a statistically significantly negative correlation between EJA reading difficulties and reading strategies. Finally, the interviews revealed the need for training in EJA reading and in-depth information on students' specific reading difficulties and their use of reading strategies. The findings of this research provide information that completes the literature from the aspect of English as a lingua franca in professional and academic reading comprehension in Taiwan, something which can also be applied to NNES graduate students worldwide. In addition, the results of the quantitative data are consistent with qualitative results that graduate students tried to use a variety of strategies to understand EJA text.

Discussion

The current and previous studies on English reading comprehension difficulties and reading strategies from the students' perspectives (see DeSoto & DeSoto, 1983; Paltridge & Starfield, 2007; Sheorey & Mokhtari, 2001) highlight the importance of recognizing the EJA reading comprehension difficulties of NNES graduate students and their association with actual reading strategy usage. In the current study, the participants attached more importance to global reading strategies, problem-solving strategies, and support reading strategies in that order. Meanwhile, problem-solving strategies were shown to be the most frequently used type in a study that investigated the differences in the use of academic reading strategies of native and non-native readers (Sheorey & Mokhtari, 2001). This inconsistency could be attributed to the different materials read by students, a student's native language and their reading abilities. However, in this case, the difference between general English reading and EJA reading is the most influential factor.

Practical implications

This study identifies some important implications for EJA reading instruction and future research. Firstly, it is absolutely essential for English-as-a-foreign-language (EFL) students to become aware of the various strategies through reading strategy instruction (Almasi, 2003; Kern, 1989). More specifically, EJA reading strategy training may help NNES graduate students to become more aware of these strategies, and to recognize and determine an effective strategy that works

for them. It will also enable them to understand how instruction in EJA reading strategies can have positive effects on learners' reading comprehension. Further studies should focus on the teaching of EJA reading instructions for graduate students using specific reading strategies. Secondly, the findings suggest that it is beneficial to identify EJA reading comprehension difficulties and at the same time encourage individual students' use of reading strategies. Based on the theoretical framework of goal-oriented nature of strategy use proposed by Dörnyei (2005) and then later reclaimed by Macaro (2006), setting goals would inspire successful language learning by developing strategies, and in particular task-solving activities. Further studies are also needed to clarify the potential role of the above view on the EJA reading strategy. Lastly, it is recommended that graduate programs provide an effective EJA reading course as this will have a positive influence on reading comprehension. Lastly, further research is needed to gain a deeper understanding of how individual EJA reading strategies affect reading comprehension. Research of this nature could be done by approaching successful and proficient NNES graduates.

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Appendix A

EJA Reading Comprehension Strategies

GLOB Strategies

1. I have a purpose in mind when I read an EJA.
2. I think about what I know to help me understand an EJA.
3. I make an overall review of the text to ascertain the context before reading an EJA.
4. I think about whether the content of the text fits my reading purpose.
5. I review the text first by noting its characteristics, such as the conventional organization of an EJA.
6. When reading an EJA, I decide what needs to be read closely and what I should ignore.
7. I use the tables, figures, and pictures in the text to increase my understanding.
8. I pay close attention to the title and abstract to enable me to better understand the EJA.

9. I scan the text for specific information (keywords, theory, etc.)
10. I critically analyze and evaluate the information presented in the EJA I am reading.
11. I check my understanding when I come across new information.
12. I try to guess what the content of the EJA is about when I read.
13. I check to see if my guesses about the EJA are right or wrong.
14. I use silent reading techniques for rapid processing.
15. I always try to learn more about statistics and research design.
16. I read a sufficient number of EJA.

SUP strategies

17. I take notes while reading to help me to understand the EJA.
18. When the text becomes difficult, I read aloud to help me understand the EJA.
19. I underline or circle information in the text to help me remember.
20. I use reference materials (e.g., a dictionary) to help me understand EJA.
21. I paraphrase (restate ideas in my own words) or summarize the text in order to better understand the EJA I am reading.
22. I go back and forth across the text to find relationships among the ideas it discusses.
23. I ask myself the questions I would like to have answered by the EJA.
24. When reading, I think about the information in both English and Chinese.
25. When reading, I translate from English into Chinese.
26. After reading, I summarize what I have read in writing.
27. I discuss EJAs I read with others in order to confirm my understanding.

PROB strategies

28. I read slowly and carefully to make sure I understand the EJA that I am reading.
29. I try to get back on track when I lose concentration.
30. I adjust my reading speed according to what I am reading.
31. When the text becomes difficult, I pay closer attention to what I am reading.
32. I stop from time to time and consider what I am reading.
33. I try to picture or visualize information to help me remember what I have read.
34. When the text becomes difficult, I re-read it to increase my understanding.
35. When I read an English journal article, I guess the meaning of unknown words or phrases.

Appendix B

The Pearson Product-Moment Correlation Coefficient Results for EJA Reading Comprehension Difficulties and the Strategies

| | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | D13 | D14 | D15 |
|----|--------|---------|---------|---------|---------|---------|---------|-------|---------|---------|---------|---------|---------|---------|---------|
| G1 | -.032 | .022 | -.080 | -.185** | -.130** | -.156** | -.079 | -.047 | -.078 | -.092 | -.089 | -.164** | -.069 | -.128** | -.220** |
| G2 | -.065 | -.042 | -.134** | -.162** | -.108* | -.190** | -.086 | -.052 | -.135** | -.150** | -.145** | -.211** | -.150** | -.186** | -.255** |
| G3 | -.070 | .007 | -.048 | -.120* | -.022 | -.128** | -.110* | -.066 | -.076 | -.142** | -.093* | -.136** | -.058 | -.144** | -.160** |
| G4 | -.018 | -.070 | -.123** | -.171** | -.078 | -.097* | -.028 | .019 | -.016 | -.087 | -.047 | -.151** | -.031 | -.078 | -.210** |
| G5 | -.109* | -.137** | -.125** | -.144** | -.075 | -.142** | -.164** | .010 | -.033 | -.064 | -.046 | -.175** | -.109* | -.144** | -.183** |
| G6 | -.096* | -.093* | -.067 | -.082 | -.092 | -.057 | -.160** | -.020 | -.046 | -.078 | -.048 | -.170** | -.100* | -.128** | -.038** |

| | | | | | | | | | | | | | | | |
|-----|---------|---------|---------|---------|---------|---------|---------|--------|--------|---------|---------|---------|---------|---------|---------|
| G7 | .024 | .067 | -.059 | -.137** | -.042 | -.238** | -.007 | -.001 | -.101* | -.059 | -.074 | -.097* | -.031 | -.109* | -.154** |
| G8 | -.011 | .013 | -.073 | -.200** | -.024 | -.106* | -.021 | -.029 | -.074 | -.062 | -.112* | -.114* | -.058 | -.114* | -.136** |
| G9 | -.064 | .031 | -.084 | -.086 | .007 | -.147** | -.084 | .000 | -.054 | -.071 | -.008 | -.150** | -.047 | -.075 | -.147** |
| G10 | -.056 | .030 | -.064 | -.173** | -.143** | -.197** | -.122** | -.106* | -.091 | -.092 | -.094* | -.202** | -.153** | -.139** | -.224** |
| G11 | -.014 | .004 | -.035 | -.077 | -.128** | -.112* | -.083 | -.029 | -.031 | -.113* | -.156** | -.157** | -.086 | -.105* | -.119* |
| G12 | -.021 | .037 | .018 | .010 | .007 | -.091 | .008 | .041 | .009 | .003 | -.016 | -.081 | -.076 | -.071 | -.030 |
| G13 | -.075 | -.020 | -.056 | -.091 | -.032 | -.118* | -.080 | -.021 | -.091 | -.064 | -.039 | -.109* | -.084 | -.142** | -.125** |
| G14 | -.192** | -.155** | -.186** | -.134** | -.131** | -.056 | -.115* | -.060 | -.022 | -.142** | -.111* | -.096* | -.104* | -.158** | -.125** |
| G15 | -.029 | -.053 | -.020 | -.179** | -.181** | -.140** | -.097* | -.022 | .017 | -.050 | -.039 | -.093 | -.127** | -.104* | -.140** |
| G16 | -.133** | -.136** | -.087 | -.175** | -.204** | -.091 | -.185** | -.097* | -.036 | -.187* | -.144** | -.155** | -.158** | -.167** | -.209** |
| P1 | .070 | .031 | -.036 | -.161** | -.065 | -.021 | .012 | .004 | -.047 | -.054 | -.107* | -.096* | -.069 | -.131** | -.169** |
| P2 | .001 | -.043 | -.038 | -.109* | -.072 | -.039 | -.064 | -.116* | -.034 | -.187** | -.177** | -.031 | -.050 | -.076 | -.109* |
| P3 | -.036 | -.055 | -.066 | -.075 | -.037 | -.041 | -.072 | -.055 | -.013 | -.034 | -.024 | -.065 | -.035 | -.085 | -.125** |
| P4 | -.007 | -.006 | -.067 | -.111* | -.075 | -.038 | .004 | -.027 | -.032 | -.066 | -.099* | -.077 | -.026 | -.065 | -.130** |
| P5 | .021 | .037 | .014 | -.098* | -.016 | -.104* | -.026 | -.024 | -.020 | -.084 | -.079 | -.039 | -.027 | -.044 | -.149** |
| P6 | -.003 | .054 | -.021 | -.062 | -.020 | -.146** | -.006 | -.024 | -.062 | -.018 | -.069 | -.046 | -.076 | -.088 | -.106* |
| P7 | -.022 | .050 | -.063 | -.105* | -.020 | -.082 | -.016 | .026 | -.069 | -.063 | -.056 | -.107* | -.001 | -.112* | -.143** |
| P8 | -.149** | -.071 | -.153** | -.024 | .000 | -.039 | -.041 | .000 | -.089 | -.078 | -.045 | -.105* | -.027 | -.109* | -.039 |
| S1 | -.017 | .34 | .003 | -.072 | -.024 | -.120* | .003 | -.028 | -.036 | -.114* | -.115* | -.110* | -.100* | -.100* | -.065 |
| S2 | -.108* | -.144** | -.069 | -.067 | .003 | .105* | -.044 | -.027 | .039 | -.078 | -.104* | .051 | -.047 | -.107* | .003 |
| S3 | .015 | .064 | -.012 | -.096* | .009 | -.110* | .009 | .003 | -.034 | -.113* | -.108* | -.183** | .000 | -.065 | -.143** |
| S4 | .077 | .099* | .097* | .023 | .070 | -.063 | .105* | .032 | .046 | -.084 | -.070 | -.052 | .025 | .031 | -.045 |
| S5 | .033 | .040 | .005 | -.123** | -.057 | -.111* | .016 | -.062 | -.112* | -.097* | -.158** | -.032 | -.030 | -.068 | -.094* |
| S6 | -.100* | -.022 | -.070 | -.151** | -.138** | -.121* | -.045 | -.037 | -.039 | -.070 | -.082 | -.133** | -.198** | -.129** | -.114* |
| S7 | -.106* | -.079 | -.026 | -.067 | -.154** | -.091 | -.126** | -.030 | -.039 | -.076 | -.059 | -.097* | -.185** | -.179** | -.123** |
| S8 | .011 | .041 | -.046 | .023 | .022 | -.033 | -.009 | .042 | -.041 | -.078 | -.074 | -.046 | -.069 | -.088 | -.113* |
| S9 | .176** | .269** | .233** | .103* | .075 | .061 | .155** | .098* | .110* | .110* | .022 | .164** | .028 | .091 | .138** |
| S10 | -.006 | -.088 | .035 | .012 | -.119* | -.017 | -.066 | .000 | .020 | -.057 | -.029 | .001 | -.036 | -.076 | .009 |
| S11 | -.128** | -.127** | -.031 | -.132** | -.149** | -.173** | -.170** | -.038 | -.052 | -.088 | -.088 | -.153** | -.128** | -.159** | -.107* |

*p < 0.05; ** p < 0.01. D=Difficulty; G= GLOB; P= PROB; S=SUP

About the Author

Kate Tzu-Ching Chen has an Ed.D. in Curriculum and Instruction (specializing in TESOL) from the University of South Dakota, USA. Her research interests are on the language learning strategies and educational technology. She is currently an Associate Professor and The Chair of the Department of Applied English at Chaoyang University of Technology, Taiwan, R.O.C. E-mail: katechen@cyut.edu.tw