

## Anaphora Resolution Strategies in L2 Reading

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Choi, Yeon Hee, Herim Ahn and Jinyoung Lee. 2018. Anaphora resolution strategies in L2 reading. *Korean Journal of English Language and Linguistics* 18-4, 395-422. This paper aims to investigate L2 learners' strategies for anaphora resolution in reading by L2 proficiency levels and academic backgrounds and by anaphora types and inferential complexity levels of anaphoric ties. Data was collected using think-aloud protocols and mouse movements captured on the computer screen of 16 Korean EFL college students performing an anaphora resolution test. The participants were recruited from two proficiency levels and two academic disciplinary areas. Results revealed dominant anaphora resolution strategies shared by the participants due to the nature of anaphora resolution and simulated testing context, such as reading the prior sentence and translating the target sentence, regardless of anaphora types. Yet, they also presented variations in anaphora resolution strategy use by anaphora and reader variables. For pronouns with low ties the L2 students relied on reference chains, whereas syntactic constraints were prevalently deployed for pronouns with high ties. For demonstrative adjectives with low ties repeated noun phrases were preferred antecedents, while use of world knowledge and topic preference appeared as frequent strategies for those with high ties. The lower level students preferred to use semantic knowledge; the higher level ones utilized syntactic and discourse knowledge. The science majors tended to focus on local sentences, while the humanities majors, especially the higher-level students, read the whole passage before identifying the antecedent. Findings from the study suggest certain strategies are preferred depending on anaphora types and levels of ties as well as L2 learners' proficiency levels and academic backgrounds.

**Keywords:** anaphora, anaphora resolution, pronoun, demonstrative adjective, antecedent, reference, cohesion, cognitive process, strategies, L2 reading, EFL reading

### 1. Introduction

In order to understand the logical structure of a text a reader needs to understand

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the links within the text by exploring devices such as a cohesive tie (Halliday and Hasan 1976), which includes an anaphor. An anaphor is a linguistic device used to refer to previously mentioned concepts within a discourse (Berkemeyer 1991), for example, pronouns and demonstratives. It is classified into two types by the location of its antecedent (Pretorius 2005): intrasentential or structural anaphora when the antecedent is within the same sentence; and intersentential or textual anaphora when the antecedent is in a different sentence.

The process of correctly determining the antecedent of an anaphor referred to as anaphora resolution (Hirst 1981, McDonald and MacWhinney 1995, Mitkov 1997, 2005) is essential in understanding the relationship between clauses or sentences and then comprehending the text (Berkemeyer 1991, Demel 1990, Pretorius 2005, Roberts, Gullberg and Indefrey 2008, Webber 1980). The ability to correctly resolve anaphoric references has thus been used as a tool for measuring L2 reading ability in tests such as the iBT TOEFL and the Korean College Scholastic Ability Test (CSAT) (Alderson 1996, Cohen and Upton 2006, MacMillan 2007, Moon 1996). Previous studies in L2 reading have revealed a significant relationship between reading and anaphora resolution abilities (Pretorius 2005), illustrating that L2 learners with lower reading proficiency are less successful in anaphoric resolution, which leads to the inability to understand the whole text (Bensoussan 1984, Berkemeyer 1991, Demel 1990, Lee 1989, Pretorius and Ribbens 2005). These studies have, however, mainly been quantitative studies, which neglect the cognitive process of anaphora resolution. Thus, process-focused exploration is called for to provide insights into such a process including the strategies L2 readers employ for successfully identifying the antecedent of an anaphor.

Anaphora resolution processes have been explored in a limited context. Though such processes seem distinctive for pronouns and demonstratives, a dearth of research has analyzed the anaphora resolution of demonstratives (Moon 1996, Pretorius 2005). Currently, only a limited number of studies has examined intersentential anaphora in a text that contains a few sentences (Garrod and Terras 2000, Grosz, Joshi and Weinstein 1995, Ko 2013, Pretorius 2005). While a number of studies have examined the role of anaphora resolution in reading (Bensoussan 1984, Berkemeyer 1991, Elbro, Oakhill, Megherbi and Seigneuric 2017, Pretorius and Ribbens 2005), most of the studies have dealt with non-testing context. Only Moon (1996) and Cohen and Upton (2006) have identified strategies used by EFL students to resolve anaphors in reading test context; yet, they have not explored whether the strategies would vary by anaphoric types and inferential complexity of anaphoric ties (e.g., distance between

anaphors and antecedents or grammatical roles of anaphors and antecedents) (Pretorius 2005). L2 learners' topical knowledge as well as their proficiency levels should also be investigated as a reader variable influencing the anaphora resolution process since readers' comprehension of a text is intricately based on their content and formal schema (Anderson 1977, Carrell 1984, 1987, Nassaji 2007).

In order to discover anaphora resolution strategies by such anaphora and reader variables, thus, the current study will investigate strategies used for pronouns and demonstrative adjectives in high or low complexity of anaphoric ties by a higher and lower proficient group of Korean EFL college students from two different academic disciplinary areas (humanities and science). The two anaphora types are selected since they are the main anaphora types in the reference items of the TOEFL and Korean CSAT and it is assumed they might trigger different anaphora resolution strategies due to their structural distinctiveness. The study will analyze think-aloud data collected in the process of anaphora resolution in the simulated setting of an EFL reading test. It will examine the problem-solving process of anaphora resolution using a screen-capture program which records both mouse movements displayed on the computer screen and vocal verbalization of the computer user.

## 2. Anaphora Resolution Factors and Previous Studies in L2 Reading

### 2.1 Factors in Anaphoric Resolution

When readers go through the process of anaphora resolution in discourse, several factors influence this process such as syntactic, semantic, pragmatic and discourse factors or world knowledge (Ariel 1994, Arnold 2001, Grosz et al. 1995, Hobbs 1978, Mitkov 1997, Pretorius 2005, Rahman and Ng 2011, van Gompel and Majid 2004, Winograd 1972). These factors have mainly been examined for intrasentential anaphora resolution; yet, they also influence intersentential anaphora resolution.

Syntactic and semantic factors can be categorized as constraints or preferences; 'constraints' eliminate impossible candidates, while 'preference' favors certain candidates over others (Mitkov 1997). For example, semantic constraints filter out semantically incompatible candidates due to verb semantics (Winograd 1972) or "animacy of the candidate" (Mitkov 1997, p. 15). For preferences, syntactic parallelism refers to the case that preference is given to the antecedent with the same syntactic

function as the anaphor, while for semantic parallelism, antecedents with the same semantic role as the anaphor is favored (Lappin and Leass 1994, Mitkov 1997).

Discourse factors include salience (focus or centering) (Grosz et al. 1995, De la Fuente 2015) or recency. Salience or focus refers to the case that the central topic which a discourse is structured around is prominent for a few sentences before the focal point shifts to a new topic (Mitkov 2005). Repetition of a noun phrase and topic continuity, which are related to salience or focus, thus have an effect on anaphoric resolution (van Gompel and Majid 2004). According to Mitkov (1997), repeated noun phrases are considered to be the preferred candidate for antecedents. When the incoming information is a continuation of the topic, the anaphora resolution is completed more quickly (Pretorius 2005). Recency (proximity or distance) is another discourse factor. When the anaphor occurs nearer to the antecedent, readers will be able to recover the information about the antecedent with ease (Joseph, Bremner, Liversedge and Nation 2015, Pretorius 2005), since longer distance will take longer activation of working memory, leading to a longer resolution time.

Pragmatic factors and world knowledge have further been discovered to have influence on anaphora resolution (De la Fuente 2015, Miltsakaki 2002, Rahman and Ng 2011). Miltsakaki's model (2002) explains that pronoun resolution is influenced by semantic and pragmatic constraints. She explains that a reader will reduce the number of potential antecedents by applying the constraints to the potential antecedents list. Pragmatic knowledge helps the reader narrow down the antecedent with semantically felicitous interpretation. World knowledge also plays a role in anaphora resolution (Rahman and Ng 2011). Though world knowledge is often differentiated from topical or cultural knowledge, all of these knowledge types can be recognized as readers' background knowledge, which is involved in identifying the antecedent of an anaphor due to its key role in reading.

Anaphora resolution processes become easier or more complex depending on types and amount of knowledge resource needed to be applied for the processes such as syntactic or semantic knowledge or contextual variables such as explicitness of the antecedent, distance between the anaphor and its antecedent, or existence of multiple plausible antecedents or conflicting candidates. How the anaphora resolution process is affected by the factors discussed before can be illustrated with Example (1), in which there are three potential antecedents for the pronoun *it* in the second sentence: *a Siberian tiger*, *the East China Park*, and *a tiny rabbit*. Yet, context-dependent meaning does not give preference to *East China Park* because the verb *escape* from in the first

sentence determines the meaning of the passive verb *be recaptured* as *be caught again* rather than *gain control of a place again*. In terms of recency, *a tiny rabbit* can be a more likely antecedent than *a Siberian tiger*; however, world knowledge proposes a more plausible antecedent is the latter due to the adjective *brave* modifying the noun *hunter*. Discourse focus or salience and grammatical subject preference also favor *a Siberian tiger* as the antecedent.

- (1) A Siberian tiger escaped from the East China Park chasing a tiny rabbit. It was recaptured by a brave hunter. (Adapted from a class note available in <http://www.cs.columbia.edu/~julia/courses/CS4705/kathy/Slides09/Class19-Pronouns/>)

As shown in Example (1), multiple factors are involved in determining the antecedent. These factors would function as strategies deployed by a reader to identify the antecedent of an anaphor in reading a text.

## 2.2 L2 Studies on Anaphoric Resolution Strategies

Prior research in L2 reading has shown that the ability to successfully resolve an anaphor is related with reading ability, mainly with the results of correlation or regression analysis (Bensoussan 1984, Berkemeyer 1991, Demel 1990, Lee 1989, Moon 1996, Pretorius and Ribbens 2005). For example, Pretorius and Ribbens (2005) found that English L2 learners with low literacy skills struggled with connecting an anaphor to its antecedent, which led them to fail comprehending a text utilizing textual clues. Yet, the studies have not explored factors that have an effect on the anaphora resolution process of EFL students or strategies employed for such a process.

The majority of research on anaphora resolution has focused primarily on intrasentential or structural anaphora, recently employing an eye-tracking technique. The eye-tracking method provides a thorough result as to where the reader is looking at in the sentence when looking for the antecedent (Cunnings, Patterson and Felser 2015, Duffy and Rayner 1990, Joseph et al. 2015, Seo and Shin 2016); nonetheless, this method does not provide an insight into the cognitive process of anaphora resolution, which takes place in the reader's mind, since it can provide information on physical eye movement. Thus, other techniques such as think-aloud techniques are needed to be deployed to explore such processes.

Compared to research on L2 intrasentential anaphora resolution, there is less

research conducted to examine L2 intersentential or textual anaphora resolution, specifically at the discourse level. The studies on intersentential anaphora resolution have been mostly limited to multi-sentential level, analyzing anaphora resolution only within a few sentences (Ko 2013, Nguyen 2017). Ko (2013) has researched the effects of grammatical and thematic cues as well as referential forms on the anaphoric resolution process of lower and higher level EFL learners in about three-sentence long texts. Results of the study indicated that grammatical cues played a significant role for higher level learners while thematic cues was found more exploitable for lower level learners. A more recent study of EFL learners in Nguyen (2017) investigated how verb semantics, coherence relations and discourse units (intrasentential or intersentential) influence Vietnamese EFL learners' interpretation of pronouns in one or two sentences. Findings from the study revealed that verb semantics had significant influence on the resolution of pronouns while the discourse unit had the least effect.

L2 studies on anaphora resolution studies have presented some factors that influence L2 learners' processes of matching an anaphor to its antecedent; however, these studies have limited to only a few factors such as syntactic or semantic factors. There is little research that have looked at diverse factors triggering the anaphora resolution process, with the exception of Pretorius (2005). Pretorius (2005) researched how different linguistic and textual factors influence the anaphora resolution of African EFL university students. She also examined the relationship between skills in anaphoric resolution, academic performance and language proficiency. The study revealed that students who were performing poorly academically were less likely to succeed in anaphora resolution, specifically those with greater anaphoric ties.

As shown in previous studies, the ability to successfully resolve an anaphor is associated with reading proficiency; hence, referent questions are frequently included in reading tests. Yet, there has been a dearth of research on the process as well as strategies L2 students employ during the anaphora resolution in the test context. Currently, two notable studies (Cohen and Upton 2006, Moon 1996) have identified such strategies used by ESL/EFL learners. Cohen and Upton (2006) conducted a study looking into the reading and test-taking strategies ESL test takers used on the pronoun referent questions of iBT TOEFL. They revealed that ESL students frequently used strategies of reading a portion of the passage referred from the question carefully as well as selecting options (the most plausible antecedent) through understanding of vocabulary, sentence, paragraph, or passage. Moon (1996) investigated strategies used by Korean high school students for the reference-

inferential items including pronouns and demonstrative adjectives in the English test section of the Korean CSAT. The study showed that the students used strategies of translation, substitution, and omission to find the antecedent. The higher proficient students were able to correctly translate the sentences, which led to successful anaphora resolution. While Cohen and Upton (2006) and Moon (1996) identified various strategies used by L2 learners through think-aloud protocols, neither studies were able to provide insight into where the learners are looking at in the passage during the process of anaphora resolution.

Despite the fact that there has been continuous research on factors influencing anaphora resolution and strategies used in the process, there is little research which explains how diverse factors other than syntactic and semantic ones influence the reader to choose a certain antecedent. Moreover, no research has explained how L2 proficiency levels and academic backgrounds or topical knowledge affect the strategies deployed in anaphora resolution, though they are a key factor leading to successful resolution of textual anaphora. In an attempt to provide a better understanding of the textual anaphora resolution process of L2 learners, the current study thus aims to explore L2 learners' proficiency and academic backgrounds, which were assumed as their topical knowledge, as well as various factors and different complexity ties of anaphora resolution in order to investigate the variables that influence such a process. The study analyzes textual anaphora resolution strategies for pronouns and demonstrative adjectives employed by Korean EFL college students with different English proficiency levels and academic backgrounds (topical knowledge) in simulated computer-mode testing context using a think-aloud technique and a computer screen-capture software. The research questions for the study are as follows.

- 1) What are L2 learners' anaphoric resolution strategies used for pronouns and demonstrative adjectives? Are there strategy variations by the learners' L2 proficiency levels and academic backgrounds?
- 2) To what extent do L2 learners' anaphoric resolution strategies differ by the complexity levels of anaphoric ties? Are there strategy variations by the learners' L2 proficiency levels and academic backgrounds?

### 3. Research Method

#### 3.1 Participants

For the current research, 16 female first- to fourth-year Korean EFL university students (the average age was 22.4), who had no prior experience of taking the iBT TOEFL, were recruited from a university in Seoul. They were grouped into two proficiency levels by the English test score of the CSAT or the TOEIC test score. Those who had a score of level 2 and above on the CSAT as well as scores higher than 800 on the TOEIC test were classified as a higher proficiency group; the TOEIC mean score of the higher level was 901, while that of the lower level was 643. For academic backgrounds or topical knowledge, each proficiency level group consisted of four students majoring in humanities or social science (philosophy, education, consumer science, communication, English education, and social studies) and four majoring in science or engineering (chemistry, pharmacy, chemical engineering, electronic engineering, and bio-engineering). The participants were categorized into four groups (four students per group): lower-level humanities (LH), higher-level humanities (HH), lower-level science (LS), and higher-level science (HS).

#### 3.2 Anaphora Resolution Test

An anaphora resolution test was constructed based on the iBT TOEFL reference questions. As the TOEFL reference questions contain two types of reference items, pronouns (P) and demonstrative adjectives (DA) reference, the test consisted of six multiple-choice questions for pronouns and demonstrative adjectives, respectively (total 12 items) (see Table 1). They were developed based on questions from iBT TOEFL test preparation books. The questions included passages on various topics from the social studies and science disciplines. The passages were modified for the purpose of the study. The number of words per passage was limited to 130 to 160 words to fit into the computer screen. The passages were also revised to control their readability from 9.4 the lowest to 13.6 being the highest.

Each question was further categorized into high or low anaphoric ties based on the anaphoric inference index developed by Pretorius (2005), which was based on four parameters to examine the inferential complexity of the anaphoric ties. Out of the four parameters, three parameters were used for this study: distance between an anaphor

and its antecedent, length of an antecedent, and grammatical functions of an anaphor and its antecedent.

**Table 1. Specification of the Anaphoric Resolution Test**

Item No.	Topic	No. of words	Anaphor	Grammatical function of anaphor	Grammatical function of antecedent	Level of anaphoric ties
P1	Science	162	<i>it</i>	Subject	Subject	Low
P2	Social studies	142	<i>it</i>	Subject	Subject	Low
P3	Science	152	<i>it</i>	Subject	Prepositional object	Low
P4	Social studies	126	<i>they</i>	Subject	Prepositional object	High
P5	Science	128	<i>they</i>	Subject	Object	High
P6	Social studies	144	<i>them</i>	Object	Object	High
DA1	Science	138	<i>this transitional zone</i>	Subject	Subject	Low
DA2	Social studies	165	<i>this type</i>	Prepositional object	Subject	Low
DA3	Social studies	152	<i>this image</i>	Subject	Subjective complement	Low
DA4	Social studies	152	<i>this critical step</i>	Prepositional object	Object	High
DA5	Science	158	<i>this practice</i>	Object	Prepositional object	High
DA6	Science	138	<i>these insects</i>	Prepositional object	Prepositional object	High

Binary points of 1 or 0 were used for each category (total 3), with the exception of grammatical roles, which were given the point of 1, 0.5, or 0. In order to measure the distance between the anaphor and the antecedent, *F* unit was used (Pretorius 2005). It is defined as a clause or clause equivalent that serves “an identifiable rhetorical function in written discourse” (Pretorius 2005, p. 530). If an anaphor and its antecedent were separated by one or more *F* units, the tie was classified as distant and assigned a point of 1. If they appeared in the adjacent *F* units, a point of 0 was assigned. The length of the antecedent was determined by the number of modifiers in the noun phrases. If an antecedent item had more than one modifier, it was classified as long and given a point of 1. If an antecedent item had no modifier or only modifier, a point of 0 was assigned. The parameter of grammatical function referred to whether the grammatical functions of the anaphor and its antecedent were subject, object, subject complement or prepositional object. If both of them were subject, a point of 0 was assigned since they shared the same grammatical role and were the discourse topic. If the grammatical function of the antecedent was other than subject, a point of

0.5 was assigned. If the anaphor was object of prepositional object, a point of 1 was assigned regardless of the grammatical function of its antecedent. Items that obtained more than 2 were classified as high inference anaphoric ties, whereas those with scores lower than 1.5 were classified as low inference anaphoric ties. Both pronoun and demonstrative adjectives items included three low and three high inference anaphoric ties, respectively, as shown in Table 1.

### 3.3 Data Collection Procedures

All the participants attended a short training session on how to verbalize their thinking process as well as move the mouse cursor simultaneously while finding the antecedent of an anaphor in a given reference item. The students were instructed to use the mouse cursor to underline the part they were reading, while verbalizing their thoughts. The students practiced verbalization with two sample items similar to those in the anaphoric resolution test. The language for think aloud was not controlled. The students verbalized mainly in Korean.

A screen-capture program called *SnagIt*, developed by TechSmith, was used to record the participants' mouse movements displayed on the computer screen simultaneously with vocal verbalization of the anaphora resolution process. The mouse movements captured by the program showed where on the screen a student was looking at during the think aloud process to find the antecedent of an anaphor.

The anaphora resolution test was administered to each participant individually by two co-researchers using a laptop in a classroom. There was no time limitation for the test. Most of the students finished the test within 40 minutes. During the think-aloud process no interruptions were made unless the participants paused for longer than 10 seconds; the co-researchers encouraged them to continue the think-aloud.

### 3.4 Data Analysis

The think-aloud data were transcribed using the conventions presented in Table 2, which was based upon Upton (1997), Schramm (2005) and Kim (2011). They were transcribed exactly as the participants spoke and the mouse movements recorded were inserted to the protocol. Since the mouse movements recorded by screen-capture program would not always accurately indicate where the participants gazed at, they were examined and revised with the think aloud data to secure their accuracy as much

as possible.

**Table 2. Transcription Conventions**

Symbols	Definition
CAPITAL WORDS	All words from the text, question and options read aloud during the think aloud were transcribed in CAPITAL WORDS.
Lower case words	All words which were spoken in English but not from the text, question or options during the think aloud were transcribed in lower case words.
?	A question mark indicates a rising intonation at the end of a word.
!	An exclamation mark indicates a sharp rise at the end of a word or phrase
/	One slash indicates a short pause under 1 second.
//	Two slashes indicate a pause longer than 1 second.
:	The colon is used to indicate the lengthening of a word
( )	The parentheses ( ) are used to indicate word or phrases that are not comprehensible.
((xs))	The double parentheses (( )) indicate a pause of x seconds.
SX	The capital letter S indicates the sentence and X indicates the sentence number.
PX	The capital letter P indicates the paragraph and X indicates the paragraph number.
{ }	The brackets { } are used to write observations of the mouse movements.

Along with the transcription conventions, a coding scheme was developed to examine the anaphora resolution strategies used by the participants (see Table 3). It included a total of 16 anaphora resolution strategies (AR) identified from prior research (Choi 1992, Cohen and Upton 2006, Ge, Hale and Charniak 1998, Grosz et al. 1995, Halliday and Hasan 1985, Hobbs 1978, Lappin and Leass 1994, Mitkov 1997, Moon 1996, Pretorius 2005, Rahman and Ng 2011, Winograd 1972). Out of the 16 strategies, syntactic parallelism and semantic parallelism were excluded because only one occurrence was identified for each strategy. The finalized coding scheme thus consisted of a total of 14 anaphora resolution strategies. Using the coding scheme, first, the co-researchers coded the think-aloud protocols; the main researcher reviewed all the coding and modified it when necessary through the discussion with the co-researchers. Furthermore, dual-coding was applied to utterances where the participants used more than one anaphora resolution strategy. A total of 242 dual-coding cases were identified: the average frequency of dual-coding was 1.26 per student by item.

**Table 3. Coding Scheme Used to Analyze the Think-Aloud Protocols**

	Strategy Category	Example
AR1	Find the antecedent based on the recency.	[HH1-DA2] [U6] <i>what is this type of LOOM?/ {cursor moves to S4} it's probably from the sentence before?/ so it is obviously WARP WEIGHTED LOOM?/ that is in the immediately preceding sentence/ so the answer is {cursor moves to options} B the warp-weighted loom</i>
AR2	Find the antecedent based on repeated NP preference.	[HS4-P2] [U6] <i>the passage keeps talking about the article/ so then the answer should be the article/</i>
AR3	Find the antecedent based on syntactic knowledge (constraints).	[HS1-P1] [U9] <i>at first// I thought the answer was INTESTINE// or SECRETIN// but it is not a plural form so I am not sure what this is//</i>
AR4	Find the antecedent based on the subject preference.	[HS2-P4] [U4] <i>WORKING CLOSELY WITH MAYORS AND CITY COUNCILS// THEY SOON if the passage is saying this/ then the noun in the prior sentence {cursor moves to S5} COMMISSIONS seems like the answer/</i>
AR5	Find the antecedent based on the semantic knowledge (constraints).	[HH3-P5] [U1] <i>{cursor is on question} THEY refers to [U2] {cursor moves to S10} THEY SHOULD BE HIGHLY/ REGULATED BY LAWS/ so they should be controlled by law and ALLOW/ oh then semantically/ only a human can be/ controlled by law/ but then the law/ can also control non-human things as well [...] [U13] {cursor moves to S10} oh/ so they have to be controlled by law so that the environment won't [...] then shouldn't they be NANOBOTS?</i>
AR6	Find the antecedent using discourse knowledge.	[HH2-DA5] [U7] <i>after YET came out/ but it is the opposite of it so {cursor circles S2 and S3}</i>
AR7	Find the antecedent by identifying the theme/rheme.	[LH3-P6] [U11] <i>{cursor moves to S5} SOME TRIBES// did this/ and the disease of Europeans/ [U12] {cursor moves to S6} AND the others/ then OTHERS {cursor moves to S5 and comes back to S6} should be these tribes/ {cursor moves to S7} due to these various reasons/ then I'm right then/ them {cursor circles them on S7} should be/ tribes/ tribes of native americans/ the answer is a</i>
AR8	Recognize the chain of the reference and track down the antecedent.	[HS1-P3] [U8] <i>oh/ the plaster in the prior sentence/ is probably about the PAINTER preparing it/ here the PAINTER// ((2s)) adds another layer of COLOR it// says applies COLOR/ so the answer is a</i>
AR9	Find the antecedent based on the preference of the discourse topic.	[LH4-DA6] [U10] <i>{cursor is at S4} oh!! this/ so the passage is talking about/ the reason why the wild bee population is decreasing {cursor circles the whole passage}/ [...] oh!! this is overall talking about wild bee and// ((3s)) {cursor circles the front part of S7} ANOTHER FACTOR/ ANOTHER FACTOR is/ oh!! another/ another wild bee is decreasing/ another reason why the bees decrease/ is because there is nothing to eat</i>

AR10	Find the antecedent using world knowledge.	[HH1-DA5] [U3] <i>this is PLACEBO effect/ this I know this/ oh/ okay okay/ PLACEBO effect</i>
AR11	Find the antecedent by reading the prior sentence(s).	[LS2-DA2] [U4] <i>{cursor is on S5} oh/ WITH THIS TYPE OF LOOM/ this TYPE of LOOM is/ it says that/ [U5] {cursor moves to S4} when I look at the prior sentence// THE WARP WEIGHTED LOOM [...] so in the prior sentence/ WARP WEIGHTED LOOM/ was/ first used here//</i>
AR12	Find the antecedent by reading the subsequent sentence(s).	[LH4-DA1] [U8] <i>{cursor is on S5} yet// ((2s)) in NORTH AMERICA/ that ZONE/ I think is probably timberline// {cursor circles S4} this timberline is// it has to show this// I know that/ this timberline is said in another word/ I should read the next sentenc/e ((6s)) {cursor moves to S6 and silently reads S6}</i>
AR13	Find the antecedent based on the passage overall theme/meaning.	[HS1-DA3] [U1] <i>I don't understand the options/ the question {cursor moves to the question} {cursor moves to option A} I think I should read all of the sentences {cursor moves to S1}</i>
AR14	Find the antecedent by translating the sentence referred to by the question.	[LS4-DA5] [U4] <i>{cursor is on S3} yet despite/ what the reports reveal/ various/ MEDICAL RESEARCHERS/ strongly oppose this PRACTICE/ what should it be/ obviously placebo effect</i>

*Notes.* The first two letters in square brackets refer to the participant's academic background and L2 proficiency level; the following number is the participant's number in the group, which precedes the item number; and the letter and number in the second square brackets refer to the unit in the think-aloud protocols. In the excerpts, the English translation of Korean utterances were written in italics. The square brackets with the three dots refer to the part of the think-aloud protocol omitted (henceforth).

Once the coding was finished, the frequencies of the strategies were counted per student and their ratio were also calculated per anaphora types (pronouns and demonstrative adjectives) and levels of anaphoric ties (high and low). The ratio was calculated by dividing the total frequency of a strategy by the total number of items. For example, if a student used a strategy three times in the six pronoun items, all the items from the low and high ties, the ratio was calculated as 0.50 by dividing three by six. The mean ratio of strategy use was calculated per strategy by the L2 proficiency groups and the academic disciplinary groups for the two anaphora types and the two levels of anaphoric ties if the strategies were used by two or more students in each group due to the fact that it could be speculated that the strategies used by only one student would be a student-specific style of anaphora resolution. To calculate the ratio of strategy use for pronouns (the six items), for example, if two or more students of the lower-level humanities group used a certain strategy, the mean ratio was calculated for the group.

## 4. Results and Discussion

### 4.1 Frequency and Ratio of Anaphora Resolution Strategies

The frequency distribution of anaphora resolution strategies reveals the participants' dominant use of three strategies (AR11, AR13 and AR14), regardless of anaphora types, L2 proficiency levels, and academic backgrounds, as shown in Table 4. The students attempted to find the antecedents by reading prior sentences (AR11), understanding the overall meaning of the whole passage (AR13) or translating the target sentences addressed in the questions (AR14). The students' frequent employment of these three strategies illustrates that they tended to read a portion of the passage referred to in the question carefully to find the antecedent, as observed in Cohen and Upton (2006).

**Table 4. Frequency and Ratio of Anaphora Resolution Strategies by Anaphora Types, L2 Proficiency, and Academic Backgrounds**

Strategy	Pronoun				Demonstrative adjective			
	LH	HH	LS	HS	LH	HH	LS	HS
AR1	1	4 (0.17)	1	0	5 (0.21)	6 (0.25)	6 (0.25)	3 (0.13)
AR2	0	1	0	1	5 (0.21)	3 (0.13)	3 (0.13)	2 (0.08)
AR3	3 (0.13)	7 (0.29)	3 (0.13)	7 (0.29)	0	1	0	2 (0.08)
AR4	2 (0.08)	2 (0.08)	0	1	0	0	0	1
AR5	9 (0.38)	5 (0.21)	9 (0.38)	5 (0.21)	3 (0.13)	4 (0.17)	5 (0.21)	4 (0.17)
AR6	3 (0.13)	4 (0.17)	2 (0.08)	4 (0.17)	2 (0.08)	5 (0.21)	2 (0.08)	5 (0.21)
AR7	4 (0.17)	3 (0.13)	2 (0.08)	3 (0.13)	0	0	1	3 (0.13)
AR8	5 (0.21)	7 (0.29)	3 (0.13)	6 (0.25)	2 (0.08)	1	1	3 (0.13)
AR9	0	1	3 (0.13)	0	7 (0.29)	3 (0.13)	1	7 (0.29)
AR10	1	0	1	3 (0.13)	4 (0.17)	2	4 (0.17)	4 (0.17)
AR11	45 (1.88)	40 (1.67)	52 (2.17)	50 (2.08)	52 (2.17)	46 (1.92)	47 (1.96)	74 (3.08)
AR12	5 (0.21)	8 (0.33)	11 (0.46)	11 (0.46)	3 (0.13)	7 (0.29)	11 (0.46)	9 (0.38)
AR13	20 (0.83)	41 (1.71)	32 (1.33)	16 (0.67)	23 (0.96)	40 (1.67)	30 (1.25)	20 (0.83)
AR14	38 (1.58)	47 (1.96)	54 (2.25)	43 (1.79)	44 (1.83)	38 (1.58)	42 (1.75)	46 (1.92)

*Notes.* The numbers in parentheses are ratios; ratios were not calculated when a strategy was used by only one student per group (henceforth).

The high frequency of reading the prior sentence (AR11) indicates the students were aware of the function of the anaphora, as shown in Moon (1996) and Joseph et al. (2015). On the other hand, the high occurrence of AR13 seems related to the

participants' strategy to understand the meaning of the whole text prior to searching the antecedent (Upton and Lee-Thompson 2001). The high frequency of AR14 also seems related to L2 learners' strategy to translate the anaphor and the referred sentence into their L1, which was also noted as a common strategy in Moon (1996).

For the items where the sentence with the anaphor appeared in the middle of the passage, some of the participants read the subsequent sentence (AR12) to find the antecedent. They may have employed this strategy to have a better understanding of the portion of the passage adjacent to the target sentence, as seen in Cohen and Upton (2006).

In addition to reading the relevant portion of the passage carefully, the participants used semantic knowledge (AR5) and discourse knowledge (AR6) to identify the antecedent. When they searched for the possible antecedent, verb semantics and semantic consistency between the anaphor and its antecedent appeared as an important factor (Mitkov 1997, Kaiser, Runner, Sussman and Tanenhaus 2009, Nguyen 2017). For example, as shown in the excerpt on Table 3 for AR5, a high-level humanities student (HH3) attempted to find the antecedent based on the semantic knowledge of the verb *regulated*, regardless of the fact whether the student had the accurate semantic knowledge of the verb. The student understood that something controlled by the law should be a human; yet, she refrained from choosing the answer and continued to read the passage. After reading the whole passage, she speculated that the law could control both a human and a non-human and finally selected "the nanobot" as the antecedent.

The participants also used discourse knowledge, which is a commonly found strategy used by proficient readers (Grabe and Stoller 2002). In the items where the anaphor appeared in a sentence including a discourse marker such as *yet* and *in addition*, the majority of the participants deployed the marker to see the relationships between the sentences and to resolve the anaphora. For example, a high-level humanities student (HH1) noticed the discourse maker *yet* in the passage and understood that the sentence following the marker would present some information contrary to that in the previous sentence, as illustrated in (2) below.

- (2) [HH1-DA1] [U6] {cursor is on S5} yet// in north america/ this// traditional ZONE/ traditional ZONE is relatively low/ DUE TO COOLER ATMOSPHERIC/ the climate is cooler/ [U7] {cursor moves to S4} TIMBERLINE// in the preceding sentence TIMBERLINE appeared slightly higher// {cursor moves to

*S5} so yet? contrary to/ in the NORTH it {cursor moves to S7} appears lower/ so/ the same timberline: {cursor moves to S6} appears lower right?/ {cursor moves to options} on the contrary/ so/ the answer is/ D*

The analysis of anaphora resolution strategies by anaphora types reveals three other frequent strategies used for resolving anaphoric pronouns besides the six strategies discussed above: exploring syntactic clues (AR3), reference chains (AR8) and rheme/theme structures (AR7) (see Table 4). According to Halliday and Hasan (1976), the information unit is structured into theme and rheme. It seems that the participants had some understanding of this structure and used it when resolving the pronoun anaphora. In excerpt (3), for instance, a low-level science student (LS4) identified the theme and the rheme to find the antecedent. LS4 read the whole passage and then read backwards realizing that the target sentence and the preceding sentence were talking about the same theme, which was *Article Six* (the subject of sentence 1 in paragraph 2), and that *Article Six* was referred to as *this article* (the subject of sentence 2 in paragraph 2) and then *it* (the subject of sentence 3 in paragraph 2).

- (3) [LS4-P2] [U10] *{cursor is on P2S3} and this article commanded/ isn't the answer article?// [U11] {silently reads P2S2} I think the answer is article six/ ARTICLE REQUIRED/ it needed/ all laws and judicial members/ and some kind of group of experts/ ((3s)) SWEAR AN OF THAT OF THE [U12] {cursor is on P2S3} in addition it commanded/ [...] so in the previous sentence the theme is about the article and in the current sentence the theme is also about the article/ {cursor moves to option C} I think the answer is ARTICLE/ I think it is ARTICLE SIX*

As for anaphora resolution strategies for demonstrative adjective items, four other strategies were also found as being often used tactics: finding the antecedent by exploring the recency (AR1), repeated noun phrases (AR2), topics (AR9) and world knowledge (AR10). For demonstrative adjectives, which is assumed more difficult to locate the antecedent than a pronoun, the participants often relied on recency, which was found as an important mechanism in Lappin and Leass' (1994) study of anaphora resolution. A high-level humanities student (HH1), for example, chose the most recently appearing candidate as an antecedent, as shown by the excerpt for AR1 in Table 3.

Variations in anaphora resolution strategies by reader variables, that is, the L2 proficiency levels and academic backgrounds of the participants, were also observed (see Table 4). The higher-level students tended to explore discourse knowledge (AR6) to resolve both anaphoric pronouns and demonstrative adjectives, regardless of their academic backgrounds. They also used syntactic knowledge (AR3) for anaphoric pronouns. On the other hand, the lower-level students utilized semantic constraints (AR5) to find the antecedent of pronouns, which is similar to the findings of Ko (2013). It can be assumed that the lower proficiency students depended on semantic clues due to their lack of the syntactic knowledge necessary for anaphora resolution. In addition, reading prior sentences (AR11) as well as reading subsequent sentences (AR12) were more noticeable from the science students in both anaphoric pronouns and demonstrative adjectives, which suggests that science majors have a tendency to focus on the sentences adjacent to the sentence where the target anaphor is located. Interestingly, a contrasting behavior was observed from the higher-level students in humanities; they kept reading the whole passage to understand the overall meaning (AR13) before searching the antecedent. The following excerpts of the think-aloud protocols from a humanities student and a science student illustrate contrasting anaphora resolution behaviors between the two academic disciplinary groups. In (4), HH3 first read the question and the sentence containing the anaphor, and then read from the first sentence of the passage. On the other hand, HS1 read the target sentence and then planned to read the subsequent sentence, as displayed in (5).

- (4) [HH3-DA2] [U1] *{cursor is on question} what is/ this TYPE?//* [U2] *{cursor moves to S5} this TYPE/ and WARP BEAM/ oh my goodness// I'll start reading from the beginning of the whole passage* [U3] *{cursor moves to S1}*
- (5) [HS1-P1] [U9] *{silently reads S6} hmm// ((3s)) in the question IT// ((3s)) stimulates the release of digestive chemicals// but at first// I thought the answer was// INTESTINE// or SECRETIN// but it is not a plural form so I am not sure what this is// I should read the next sentence*

Strategy use variations were also noted from the science students' use of world-knowledge for pronoun and demonstrative adjective items. These students deployed their knowledge of science in science topic passages (see excerpt (6) below).

- (6) [HS3-P1] [U3] *{cursor is on options} I should look at the options/*

BLOODSTREAM/ PANCREAS/ FOOD/ SECRETIN// {cursor moves to S6} then um/ if it stimulates secretion of digestive substances// {cursor moves to options} FOOD or SECRETIN?// FOOD or SECRETIN// ((2s)) either one should be the answer [...] [U6] {cursor is on S6} If it says DIGESTIVE CHEMICALS then secretin?// secretin might be the answer// [...] [U9] {cursor moves to S5} SECRETIN is/ in the pancreas/ {cursor underlines end of S5 to S6 and moves to options} and stimulates secretion/ then the answer is A

In the excerpt (6), a high-level science student (HS3) was able to narrow down the answer by reading the options and target sentence; she had the topical knowledge that either food or secretin stimulates the secretion of digestive substances and then was able to correctly translate the passage to identify the antecedent of the pronoun.

#### 4.2 Ratio of Anaphora Resolution Strategies by Levels of Anaphoric Ties

The analysis of anaphora resolution strategies reveal strategy variations by inference complexity levels of anaphoric ties. Besides the dominant strategies discussed before (AR11 to AR14) regardless of anaphora types, the participants often explored cohesive chains (AR8) for pronouns with low anaphoric ties (P-low) (see Table 5). From this finding it can be assumed that it is relatively easier to track down the antecedent through a sequence of expressions referring to the same entity since pronouns tend to refer back to a specific item in the preceding sentences (Halliday and Hasan 1976). The participants also explored the most recently mentioned referent in a short distance (AR1), such as in the immediately preceding sentence (Givón 1983).

On the other hand, use of syntactic knowledge (AR3) was observed more frequently for pronoun items with high anaphoric ties (P-high), as found in Moon (1996) and Mitkov (1997). As illustrated in (7), for example, a low-level humanities student (LH3) deployed the syntactic knowledge that the object of a relative clause cannot be the subject of the same sentence.

(7) [LH3-P5] [U3] {cursor moves to S10} THEY SHOULD BE HIGHLY/ REGULATED/ something should be regulated by law/ then the answer is not SCIENTISTS/ because it is the object of the relative clause/ TO DO SAFE// to do safe experiments/ so I think the answer is NANOBOTS {cursor moves to S8}

**Table 5. Ratio of Anaphora Resolution Strategies for Pronouns  
by Levels of Anaphoric Ties**

Strategy	Pronoun-Low				Pronoun-High			
	LH	HH	LS	HS	LH	HH	LS	HS
AR1	1	4 (0.33)	1					
AR2				1		1		
AR3		2		3 (0.25)	3 (0.25)	5 (0.42)	3 (0.25)	4 (0.33)
AR4	2 (0.17)	1				1		1
AR5	4 (0.33)		4 (0.33)	2 (0.17)	5 (0.42)	5 (0.42)	5 (0.42)	3 (0.25)
AR6	2 (0.17)	3 (0.25)	1	3 (0.25)	1	1	1	1
AR7		2 (0.17)	2 (0.17)		4 (0.33)	1		3 (0.25)
AR8	4 (0.33)	5 (0.42)	3 (0.25)	5 (0.42)	1	2 (0.17)		1
AR9			1			1	2 (0.17)	
AR10			1	3 (0.25)	1			
AR11	22 (1.83)	22 (1.83)	29 (2.42)	27 (2.25)	23 (1.92)	18 (1.50)	23 (1.92)	23 (1.92)
AR12	2	3 (0.25)	10 (0.83)	6 (0.50)	3 (0.25)	5 (0.42)	1	5 (0.42)
AR13	10 (0.83)	17 (1.42)	13 (1.08)	7 (0.58)	10 (0.83)	24 (2.00)	19 (1.58)	9 (0.75)
AR14	21 (1.75)	25 (2.08)	33 (2.75)	23 (1.92)	17 (1.42)	22 (1.83)	21 (1.75)	20 (1.67)

The comparison of pronoun anaphora resolution strategies by the levels of anaphoric ties also reveals variations by L2 proficiency levels in addition to those discussed before. For low levels of anaphoric ties, the higher-level students employed a strategy related to utilizing syntactic constraints (AR3), while the lower-level students deployed semantic constraints (AR5). This strategy use pattern by L2 proficiency levels was identified for the anaphoric pronouns, as discussed in Section 4.1; it appears to be attributed to the strategy use for low anaphoric ties. Academic background variations were not much noticeable by the levels of anaphoric ties, though the lower-level students of science frequently explored more local information (AR11, AR12, and AR14) for the low level of anaphoric ties.

The analysis of anaphora resolution strategies for demonstrative adjectives by the levels of anaphoric ties reveals that AR2, AR9, and AR10, which were found as commonly used strategies for demonstrative adjectives as discussed in Section 4.1, appeared to be more frequently employed for either low or high levels of anaphoric ties (see Table 6). A repeated noun phrase was often preferred as the antecedent (AR2) for the items with low anaphoric ties (DA-low), as repeated noun phrases are identified as a preferred candidate for the antecedent in Mitkov (1997) and Ge et al. (1998). Meanwhile, exploring discourse topics (AR9) and world knowledge (AR10) were frequently employed strategies for the demonstrative adjectives with high

anaphoric ties (DA-high). The participants seemed to favor the antecedent which is the topic of the passage. Such a strategy is a common anaphoric resolution factor according to Givón (1983), Brennan, Friedman, and Pollard (1987), and Grosz et al. (1995). Additionally, the participants used world knowledge for the DA-high items, where anaphora is more difficult to resolve due to the distance, length, and grammatical role of the antecedent. World knowledge provided the necessary information or clues to find the correct antecedent, which is similar to Rahman and Ng's finding (2011). For example, a few science and humanities students had topical knowledge of the placebo effect, which helped them quickly figure out the antecedent, as illustrated in (8).

**Table 6. Ratio of Anaphora Resolution Strategies for Demonstrative Adjectives by Levels of Anaphoric Ties**

Strategy	Demonstrative adjective-Low				Demonstrative adjective-High			
	LH	HH	LS	HS	LH	HH	LS	HS
AR1	2 (0.17)	4 (0.33)	3 (0.25)	3 (0.25)	3 (0.25)	2 (0.17)	3 (0.25)	
AR2	5 (0.42)	3 (0.25)	3 (0.25)	2 (0.17)				
AR3		1		2 (0.17)				
AR4				1				
AR5	1	3 (0.25)	1	2 (0.17)	2 (0.17)	1	4 (0.33)	2 (0.17)
AR6	2 (0.17)	4 (0.33)	2 (0.17)	4 (0.33)		1		1
AR7			1	3 (0.25)				
AR8	2 (0.17)	1	1	3 (0.25)				
AR9	2 (0.17)	1	1	2	5 (0.42)	2 (0.17)		5 (0.42)
AR10	1				3 (0.25)	2	4 (0.33)	4 (0.33)
AR11	21 (1.75)	23 (1.92)	28 (2.33)	38 (3.17)	31 (2.58)	23 (1.92)	19 (1.58)	36 (3.00)
AR12	2 (0.17)	4 (0.33)	5 (0.42)	4 (0.33)	1	3 (0.25)	6 (0.50)	5 (0.42)
AR13	13 (1.08)	16 (1.33)	17 (1.42)	8 (0.67)	10 (0.83)	24 (2.00)	13 (1.08)	12 (1.00)
AR14	21 (1.75)	23 (1.92)	20 (1.67)	21 (1.75)	23 (1.92)	15 (1.25)	22 (1.83)	25 (2.08)

- (8) [HH1-DA5] [U3] *um/ the simple process of/ ADMINISTERING/ PLACE PLACEBO?/ oh!/ this is PLACEBO effect/ this I know this/ oh/ okay okay/ PLACEBO [...]* [U4] *{cursor moves from option A to C} I think it is this/ it's talking about PLACEBO/ it is against PLACEBO effect/ against administering/ so the answer is D*

Within the demonstrative adjective items, it was found that the higher-level participants attempted to find the antecedent employing discourse clues such as

sentence connectives (AR6) for the low level of anaphoric ties. When the strategy use pattern was analyzed by the academic backgrounds, similar results to those of the pronoun items were found. Both academic disciplinary groups shared a pattern, as discussed in Section 4.1, where the science students referred to prior sentences (AR11) while the high-level humanities students tended to read the whole passage (AR13). Particularly for item DA6, the two academic disciplinary groups displayed use of these distinct strategies as shown in excerpt (9) and (10).

- (9) [HS4-DA6] [U1] *{cursor moves to S8} um/ it looks like the passage is going to talk about different insects//* [U2] *{cursor moves to S7} if I look at the front front sentence// [...]* [U3] *if I look here/ {points at another factor on S7} ANOTHER FACTOR and {points at other factor on S8} OTHER FACTOR are probably talking about the same thing/ [...]* [U4] *{cursor moves to option D} the answer is D// HONEY BEES*
- (10) [HH3-DA6] [U1] *{cursor is on question} this insect/* [U2] *{cursor moves to options} these are mentioned {cursor circles the options and then moves to S8}* [U3] UNDERLYING ALL THE OTHER FACTORS CLIMATE// [...]
- [U4] *{cursor moves to S1} [...]* [U5] *{cursor moves to S2} [...]* [U11] *{cursor moves to S8} the other factors/ because of these other factors/ the climate change/ um these// {cursor circles these insects} keeps declining/ {cursor moves to S1} then the answer is the first thing that started declining which is/ {cursor moves to option A} the answer is WILD BEES*

The high-level science student (HS4) read sentences 7 and 8 several times before deciding the final answer, as shown in (9) above. On the other hand, the high-level humanities student (HH3) read the target sentence, which is sentence 8, and then moved to the first sentence of the passage to read the whole passage, as displayed in (10).

## 5. Conclusion and Implications

The results of the study reveal that the L2 learners shared a certain anaphora resolution strategy pattern, which seems attributable to the nature of anaphora resolution and stimulated testing setting. As observed in Cohen and Upton (2006), the

learners frequently read the prior sentence or translating the target sentence to identify the antecedent regardless of anaphora variables such as anaphora types and inferential complexity levels of anaphoric ties. They also often read the whole passage and deployed semantic knowledge and discourse knowledge. The analysis of strategy patterns further illustrates variations in anaphora resolution strategies not only by anaphora types and levels of anaphoric ties but also by academic backgrounds and L2 proficiency levels. Exploring reference chains was dominant for pronouns with low anaphoric ties, while use of syntactic knowledge was employed commonly for those with high anaphoric ties. These indicate that the students deployed different strategies depending on the levels of anaphoric ties, which is contrary to Nguyen (2017), who found that only verb semantics predict the process of anaphora resolution regardless of context. With demonstrative adjectives, searching the antecedent based on recency, repeated noun phrases, discourse topics and world knowledge was frequently performed.

In the items with low anaphoric ties, the participants commonly referred to the nearest plausible antecedent, whereas they deployed the topic of the passage and world knowledge for those with high ties. Findings from the results further suggest the influence of reader variables such as L2 learners' proficiency levels and academic backgrounds or topical knowledge. The higher level students utilized discourse knowledge as well as syntactic knowledge to find the antecedent for both pronouns and demonstrative adjectives. On the other hand, the lower level students preferred to use semantic knowledge, as shown in Ko (2013). Moreover, anaphora resolution strategies contrasted depending on academic backgrounds. The science major students had a tendency to focus on local sentences, while the humanities major students, especially the higher-level students, read the whole passage before locating the antecedent.

The current study suggests anaphora and reader variables as factors influencing anaphora resolution strategies. Yet, caution is needed to make valid generalization of the outcome of the research. There is a possibility that the findings from the study would have been antecedent item-based, that is, the anaphora resolution test items might have led the participants to use certain strategies. Another limitation lies in the fact that the study has not examined strategy variations by academic backgrounds in details. To ensure that the results of the study are conclusive, it is advised that a larger group of students from diverse majors and proficiency groups be investigated. Besides the reader variables, further studies should also explore other anaphora variables such as distance between anaphors and antecedents and the length of

passages as well as other anaphoric types including demonstrative pronouns.

The results of the study have displayed variations in anaphora resolution strategies by L2 proficiency levels, as implied in Ko (2013), Moon (1996) and Pretorius (2005). The finding that low-level students did not show distinctive uses of particular strategies compared to high-level students suggest that less proficient learners need to be exposed to diverse strategies and be trained to select strategies appropriate to the target anaphora depending on its context. The strategy use variations between the two academic disciplinary groups might suggest that anaphora resolution instruction should be tailored to the students' academic backgrounds. Yet, the present study has not explored which strategy leads L2 learners to identify the antecedent successfully. The present study has not investigated whether the science students' focus on local sentences or the higher-level humanities students' comprehension of the whole passage led to successful anaphora resolution than other strategies. Future studies should examine this issue to provide more specific pedagogical implications.

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Examples in: English  
Applicable Languages: English  
Applicable Level: All

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