Postulating hypotheses in experimental doctoral dissertations on Applied Linguistics: A qualitative investigation into rhetorical shifts and linguistic mechanisms

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Abstract

The extent to which research hypotheses need to be incorporated in experimental studies often becomes a subject of discussion among academics supervising the writing of theses and dissertations. While writers are concerned about how hypotheses can be strategically linked with other elements in research reports to effectively present an introductory chapter, instructors are considering ways of guiding learners to use the appropriate language in postulating research hypotheses. Using an analytical framework developed by Swales (1990 & 2004) and specialist informants' qualitative data, this largely qualitative investigation looks into a corpus of experimental doctoral dissertations submitted to 32 American universities from 2001 to 2009 in order to ascertain (i) the degree to which research hypotheses need to be presented in dissertation introductions, (ii) how hypotheses are strategically linked with other rhetorical segments, and (iii) the salient linguistic mechanisms used to achieve the communicative functions. This study has revealed (i) how writers shift from pertinent communicative moves to the postulation of hypotheses, and (ii) the gamut of major language choices employed to postulate these hypotheses. The findings can be used to prepare teaching materials that help learners comprehend and employ the rhetorical strategies and linguistic mechanisms needed in postulating hypotheses in research reports.

Keywords: genre analysis, dissertation writing, hypothesis formulation, research hypotheses, teaching/learning materials.

Resumen

Formulación de hipótesis en tesis doctorales de tipo experimental en el ámbito de la Lingüística Aplicada: una investigación cualitativa sobre cambios retóricos y mecanismos lingüísticos

Hasta qué punto las hipótesis de una investigación deben ser incluidas en un estudio experimental se convierte a menudo en objeto de debate entre los directores de trabajos de investigación y tesis doctorales. Si bien los doctorandos se preocupan de cómo vincular estratégicamente las hipótesis con otros elementos en el proyecto de investigación para presentar con eficacia un buen capítulo introductorio, los directores se preocupan más de cómo guiar al alumno de doctorado para que pueda utilizar el lenguaje de manera apropiada para la formulación de las hipótesis de trabajo. En base al marco analítico desarrollado por Swales (1990 y 2004), así como datos cualitativos de informantes especialistas, el presente estudio cualitativo analiza un corpus de tesis doctorales de tipo experimental presentadas en 32 universidades americanas desde 2001 hasta 2009 para determinar (1) hasta qué punto las hipótesis de investigación deben ser planteadas en la introducción de la tesis; (2) cómo se vinculan estratégicamente las hipótesis con otros elementos retóricos; y (3) qué mecanismos lingüísticos más relevantes se emplean para lograr funciones comunicativas. Este estudio pone de manifiesto (1) cómo los escritores sustituyen secuencias comunicativas típicas por la formulación de hipótesis; y (2) las principales expresiones lingüísticas empleadas para la descripción de dichas hipótesis. Los resultados obtenidos pueden servir para preparar materiales didácticos que ayuden a los doctorandos a entender y emplear estrategias retóricas y mecanismos lingüísticos necesarios para formular hipótesis en los trabajos de investigación.

Palabras clave: análisis de género, escritura de tesis, hipótesis de investigación, materiales docentes/de aprendizaje.

1. Introduction

Over the last decade, numerous scholars have taken an interest in investigating the communicative moves of research introductions in a wide range of disciplines, notably because of the pedagogically useful findings in the context of teaching English for specific academic purposes (ESAP). The disciplines involved in their studies on research introductions have so far covered Physics (Swales & Najjar, 1987), Software Engineering (Anthony, 1999), Conservation Biology and Wildlife Behaviour (Samraj, 2002 & 2005), Computer Science (Shehzad, 2008, 2010 & 2011), Law (Tessuto, 2008),

Applied Linguistics (Hirano, 2009), Educational Psychology (Swales & Najjar, 1987; Loi & Evans, 2010), Medicine (Zhang & Hu, 2010), Economics (Lakic, 2010), Agricultural Sciences (del Saz Rubio, 2011), Civil Engineering (Kanoksilapatham, 2011), and Management (Lim, 2012; Mur-Dueñas, 2012) among others. The proliferation of these studies on research introductions in recent years may be ascribable to the broad acceptance of a genre-based analytical framework proposed by Swales (1990 & 2004) and the wide-ranging implications of these genre-based studies for reading and writing instruction.

Swales (2004) considered research introductions as a part-genre containing three moves, known as (i) "establishing a territory" via topic generalisation in Move 1, (ii) "establishing a niche" in Move 2 which mainly involves gap indications and extensions of the existing research tradition, and (iii) "presenting the present work" (previously known as "occupying the niche") in Move 3 which covers purpose statements, research questions, hypotheses, definitional clarifications, method-related summaries, announcements of principal outcomes, value statements, and structure indications. Although many previous studies that adopted the three-move Swalesian model mentioned above have revealed the degrees to which generic structures differ across disciplines, they have devoted relatively little attention to the linguistic realisations of these communicative moves and steps. For instance, Ozturk (2007), Hirano (2009), del Saz Rubio (2011) have respectively analysed the research introductions in Applied Linguistics and Agricultural Sciences, whereas Soler-Monreal, Carbonell-Olivares and Gil-Salom (2011) have studied dissertation introductions in Computing. Nonetheless, their focus is mainly on the move sequences (for instance, "M1-M2-M1-M3", etc.) while scant attention has been directed to the specific linguistic mechanisms needed to accomplish these moves. Studying these linguistic mechanisms is important in an instructor's preparation for an ESAP lesson because past research has shown that learners are able to transfer many of the generic features, including rhetorical organisation and language resources, which they had previously studied into their writing subsequently (Cheng, 2007).

Despite the existence of some studies (for example, Lim, 2012; Shehzad, 2008) which have devoted considerable attention to the linguistic realisations of Move 2 (that is, "establishing a niche"), many steps in the subsequent Move 3 have yet to be studied thoroughly in close relation to the language resources. Among the steps in Move 3, research hypothesis postulation (RHP) stands out as an occasionally optional and yet generally important

step in different academic disciplines (Swales, 2004). The need to study the rhetorical functions and linguistic realisations of hypothesis postulation is justifiable for two reasons. First, there is evidence attesting to the fact that second language dissertation writers in non-Anglophone countries encounter problems in presenting hypotheses in English. In the following authentic instances of hypothesis-related segments, errors committed by five different postgraduate candidates in a non-Anglophone country are italized, and suggested corrections and insertions/additions are indicated in parentheses:

- There is *significant different* (a significant difference) in stress between Type A and Type B respondents.
- There *are significant effect* (is a significant effect) of gender on the relationship between self-confidence and organisation's structure of opportunity, supportive relationships of career success.
- The more *enhance* (enhanced) the relationship quality the higher the satisfaction enjoyed by the customer.
- *Respondent's age* (A respondent's age) has *significant relationship* (a significant relationship) to (with) venture growth.
- Expectancy *is positively influence* (is positively influenced by) the motivation on performance.

The aforementioned examples have illustrated that these postgraduate candidates' mistakes in writing research hypotheses are not merely restricted to those affecting subject-verb concord, but may also include other lexical, syntactic and morphological errors related to the use of verbs, prepositions and nouns. As such, if novice writers are given sufficient pre-writing examples in instructional sessions before reading authentic text segments, they may be able to see how the communicative functions of these rhetorical segments are fulfilled using the linguistic mechanisms exemplified in the instances. Adequate instances may also be used in post-writing activities as frames of reference to help novice writers correct some common errors in related text segments.

Second, it would be interesting to ascertain the prominence of hypothesis postulation, especially when the language and discipline concerned are taken into consideration. Previous research seems to suggest that both the language used and the discipline concerned may have a bearing on the frequency with which research hypotheses would occur. For instance, in

Educational Psychology, hypothesis testing has been found in as high as 75 percent of the English research articles, but it is completely absent in Chinese research articles in the same discipline (Loi & Evans, 2010).

Across disciplines, however, hypothesis testing constitutes a principal step found in a third (33.3%) of the research article introductions (RAIs) in Wildlife Behaviour in English, but its frequency differs from that in Conservation Biology RAIs, in which "there is a general absence of a list of hypotheses to be verified in the introduction" (Samraj, 2002: 13). Samraj (2002: 11) argued that "observed animal behaviour is interpreted in terms of previously postulated hypotheses or is the basis for modifications of older hypotheses". The frequencies of hypothesis postulation also differ in other applied science disciplines. For instance, hypothesis formulation has been found to be completely absent in Civil Engineering RAIs (Kanoksilapatham, 2011) while Computing RAIs also contain very few occurrences of hypotheses (Shehzad, 2008). In this study, it would therefore be important for us to select the introductions in a discipline (such as Applied Linguistics) in which research hypotheses are likely to occur, so that sufficient research hypotheses in the discipline concerned could be collected and studied in terms of their linguistic features. This study is also novel in view of the fact that the aforementioned studies have not focused on how linguistic resources are used in postulating research hypotheses.

If we intend to conduct an in-depth qualitative study into how hypothesis postulation is realised linguistically (for the sake of assisting novice writers to postulate research hypotheses correctly), it is necessary to select a research genre in which hypotheses are more likely to occur frequently. This requires us to consider (i) the research genre (dissertations or journal articles), (ii) the research methods (qualitative or quantitative methods), (iii) the language used (Spanish, English, or Chinese), and (iv) the discipline concerned (Civil Engineering, Computing, or Applied Linguistics). In view of such considerations, we chose published doctoral dissertations in a major Anglophone country, which are based on quantitative experimental research in Applied Linguistics, for four reasons. First, published dissertations/theses are more likely to include more hypotheses compared to journal papers, and doctoral dissertation writers are allowed to fully illustrate how research hypotheses are linked with other rhetorical elements compared to journal papers which have some spatial constraint in the form of word limit. Second, quantitative studies are more likely to include research hypotheses than qualitative studies (Fraenkel & Wallen, 2003; Creswell, 2008; Gay, Millis &

Airasian, 2009). Third, the previous studies on research introductions reviewed above (see, for example, Loi & Evans, 2010; Soler-Monreal, Carbonell-Olivares & Gil-Salom, 2011) have highlighted the possibility that research introductions in English may be more likely to incorporate research hypotheses than those written in certain languages, such as Chinese and Spanish. Fourth, in a preliminary survey, we have found that research genres in Applied Linguistics are likely to incorporate adequate hypotheses that could facilitate our inquiry into the linguistic resources used in postulating hypotheses. More precisely, although past research has been conducted on research article introductions in Applied Linguistics (Ozturk, 2007), the linguistic realisations of research hypotheses in published doctoral dissertations have yet to be studied in sufficient detail.

Given the lack of focus on linguistic resources and some uncertainty over the frequency of hypothesis postulation in dissertation introductions (compared to article introductions), this study has opted to identify (i) the extent to which hypothesis postulation is included in doctoral dissertation introductions, and (ii) the positioning and lexico-grammatical mechanisms used to present the hypotheses concerned. In this largely qualitative investigation, two research questions are formulated as follows:

(1) To what extent are research hypotheses incorporated in the introductory chapters of American doctoral dissertations on Applied Linguistics?

(2) What rhetorical shifts and lexico-grammatical mechanisms do doctoral dissertation writers use to postulate research hypotheses in these dissertations?

The first research question seeks some quantitative data to ascertain the frequency with which the research hypotheses are incorporated in the corpus of American doctoral dissertations.[1] The second question seeks essentially qualitative data that reveal the possible range of rhetorical shifts and salient lexico-grammatical choices used by dissertation writers to postulate research hypotheses as part of their effort to gain acceptance into the academic research community. It also focuses on obtaining some quantitative data with respect to the frequencies of tenses employed by dissertation writers in postulating research hypotheses.

2. Research procedures

This study was conducted in three stages involving: (i) a careful selection of published doctoral dissertations on Applied Linguistics research, (ii) a genre analysis of the dissertations, and (iii) face-to-face semi-structured interviews with American advisors supervising the writing of doctoral dissertations.

2.1. Procedures for selecting doctoral dissertations

We purposively selected 32 doctoral dissertations on Applied Linguistics in accordance with the criterion that the dissertations should be based on quantitative experimental research. The criteria employed in identifying quantitative experimental research were based on the features explained by Gay, Millis and Airasian (2009) and Creswell (2008). This means that all the experimental research reported in the dissertations adopted a deductive approach, focused on objective reality to be discovered and established cause-effect relationships between a dependent variable and at least one independent variable. The dissertations were completed in partial fulfilment of the requirements for the Doctor of Education (Ed.D.) degree or the Doctor of Philosophy (Ph.D.) degree, and submitted to American universities from 2001 to 2009. We selected only one doctoral dissertation which had been submitted to each of the 32 American universities during that period to ensure that the corpus was not affected largely by the influence of a specific set of supervisors at a university or the preferred requirements of certain universities. The evenly distributed purposive sample therefore precluded over-reliance on the requirements and expectations of only a small group of U.S. universities, given that all of them constituted members of the academic discourse community concerned.

2.2. Procedure for analysing research hypotheses

Using Swales' (1990 & 2004) move-step analytical framework, we examined the published dissertations with reference to the communicative functions of each introductory chapter. Attention was first focused on dividing the texts into the three major introductory moves reviewed above before all the segments connected with hypothesis postulation were marked distinctly. The number of occurrences of RHPs was calculated with reference to the number of times it appeared without being interrupted by any other step. An RHP might consist of a main clause or several sentences insofar as its occurrence was not interrupted by any other rhetorical step. Subsequently,

prominent shifts from one segment (that is, rhetorical move or constituent step) to an RHP were analysed if they demonstrated recurrent linkages between different rhetorical segments. Each RHP was analysed by considering its position of occurrence in the doctoral dissertations.

Attention was then directed to how writers performed the rhetorical functions of RHPs using lexico-grammatical choices, including sentence structures, clause elements, and categories of phrases or words. In segments where obvious lexico-grammatical structures were evident, the instances obtained from the dissertations were tabulated to illustrate the common patterns (which are useful in the preparation of teaching materials for second language writers of English). Salient language choices were identified on the basis of (i) general linguistic descriptions provided by Quirk et al. (1985), Greenbaum and Quirk (1992), and Downing and Locke (2006), and (ii) lexico-grammatical descriptions for research-related genres as illustrated by Thomas and Hawes (1994) and Lim (2006, 2011a & 2011b). With respect to the tenses used by the doctoral students in postulating research hypotheses, all finite verbs (verbs showing tense distinction) used by the writers (for constructing hypotheses) were highlighted before the frequencies of the verbs in each of the major tenses were counted and compared.

2.3. Semi-structured interviews

Semi-structured interviews were conducted with two experienced American doctoral dissertation supervisors who had successfully completed their supervision of experimental research in Applied Linguistics. The supervisors played the role of "specialist informants" (Swales, 1990: 129; Bhatia, 1993: 34) who provided views on the postulation of research hypotheses. The interviews, digitally recorded in the supervisors' offices, were conducted after the rhetorical analysis to ensure that problems arising from the earlier phases could be presented orally to the informants. Open-ended questions were used in the interviews (Lynch, 1996; Berg, 2004) to elicit responses from the supervisors in regard to (i) the significance of research hypotheses in doctoral dissertations on experimental studies in Applied Linguistics, and (ii) the fundamental requirements and expectations of the academic discourse community in regard to the postulation of hypotheses.

3. Results and discussion

To provide an overview about the data elicited, some general findings based on the specialist informants' spoken data are first reported here before the quantitative results about the frequencies of RHPs and their lexico-grammatical realisations are presented. To specialist informant A (SIA), when dissertation writing is considered "at a higher level", the research hypotheses are generally used "to ensure what the reader is going to understand how to read the dissertation". Similarly, specialist informant B (SIB) viewed research hypotheses as central in both the writing process and the reading process given that they would inform the reader of what they needed to look for, without which the doctoral candidates would not know the direction in which the dissertation should proceed.

Another interesting aspect has to do with the positioning of research hypotheses in doctoral dissertations. An analysis of the positions of occurrences of RHPs also furnishes pertinent information on how dissertation writers strategically direct their studies in dissertation introductions (DIs) whose average length is 16.6 pages (see Table 1). (The frequencies of verbs used in RHPs will be discussed in section 3.4.)

Category	Frequency of RHPs	Frequencies of verbs		
		Simple past	Simple present	Simple future
No. of occurrences	25	45	34	37
Mean	0.78	1.41	1.06	1.16
No. of DIs	16	10	10	8
Percentage of DIs (with RHPs)	50.0	62.5	62.5	50.0

Table 1. Frequencies of hypothesis postulations and verb tenses used in RHPs.

The general pattern shows that a vast majority of the dissertation writers place their hypotheses (13/16) in the medial portions after sufficient background information and literature have been presented. Overall, as SIB has pointed out, in experimental research, doctoral students are normally advised to place their hypotheses after they have stated the purpose of the studies.

3.1. Distribution of research hypotheses

In terms of the distribution, postulation of research hypotheses appears in only 16 of the 32 DIs, thus showing that 50% of the doctoral dissertation writers did not include any hypothesis in their introductory chapters on

quantitative experimental research. The total frequency of the hypothesis postulation is 25 (the mean frequency being 0.78). Overall, the quantitative analysis has confirmed Swales' (2004) statement regarding the optional status of research hypothesis in the present study. To ascertain whether the distribution of the occurrences of RHPs is dependent upon the overall macro-structure of the experimental dissertations, a Mann-Whitney U-test was conducted to identify any possible inter-structural differences, which are actually the differences due to the distinction between the Introduction-Method-Results-Discussion (IMRD) structure and the Introduction-Literature Review-Method-Results-Discussion (ILMRD) structure in the occurrences of RHPs in the entire corpus of DIs.[2] As the asymptotic value for RHPs across the dissertation introductions with the two structures is 0.752 (that is, $p > 0.05$), there is no significant difference between the DIs employing the ILMRD structure and those using the IMRD structure in terms of the occurrences of all the constituent steps.

The ways in which hypotheses are realised rhetorically in experimental doctoral dissertations can be fully understood if we analyse (i) the inter-step and/or inter-move shifts concerning research hypotheses, and (ii) the salient linguistic features of RHPs. The following section provides the results based on the qualitative analysis of the linguistic mechanisms employed to fulfil each rhetorical step, and the connections between RHPs and their preceding or ensuing rhetorical category (that is, move or step).

"Postulating a hypothesis" is a step found in half (16/32 or 50%) of the DIs. Even though each research question in the DIs is not immediately ensued by a corresponding hypothesis, a subsection containing several research hypotheses is generally preceded by a subsection on research questions. Interestingly, more than half of the doctoral dissertations containing research questions (i.e., 53.8% or 14/26) also have hypotheses presented in them. In contrast, only a small proportion (2/16) of the DIs containing research hypotheses does not have research questions. This means that in most (87.5% or 14/16) of the DIs containing research hypotheses, the appearance of hypotheses is highly contingent upon the occurrence of research questions.

3.2. Interconnections between hypotheses and research questions

The appearance of hypotheses largely hinges on the inclusion of research questions, and hypotheses are generally incorporated in addition to research questions (see Figure 1).

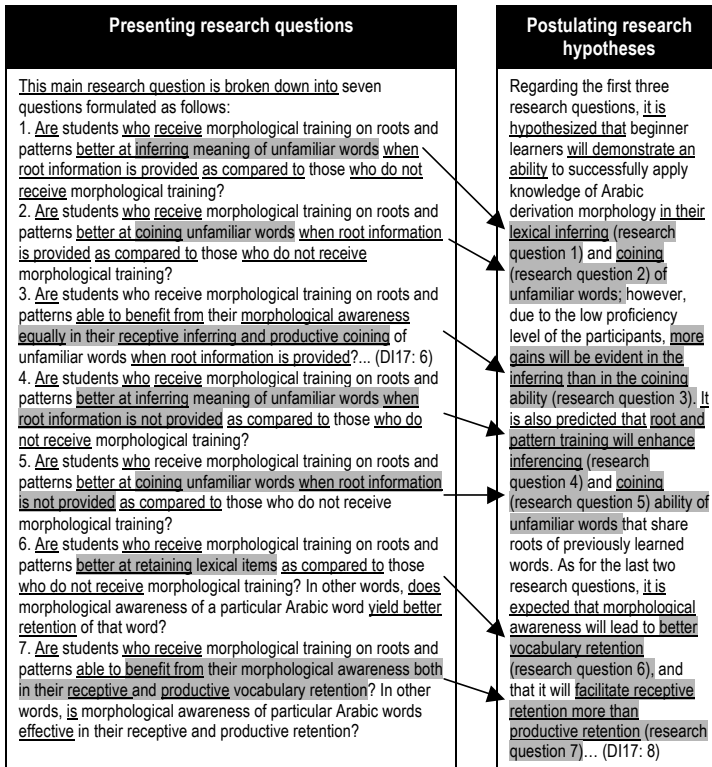| Presenting research questions	Postulating research hypotheses
This main research question is broken down into seven questions formulated as follows: 1. Are students who receive morphological training on roots and patterns better at inferring meaning of unfamiliar words when root information is provided as compared to those who do not receive morphological training? 2. Are students who receive morphological training on roots and patterns better at coining unfamiliar words when root information is provided as compared to those who do not receive morphological training? 3. Are students who receive morphological training on roots and patterns able to benefit from their morphological awareness equally in their receptive inferring and productive coining of unfamiliar words when root information is provided?... (DI17: 6) 4. Are students who receive morphological training on roots and patterns better at inferring meaning of unfamiliar words when root information is not provided as compared to those who do not receive morphological training? 5. Are students who receive morphological training on roots and patterns better at coining unfamiliar words when root information is not provided as compared to those who do not receive morphological training? 6. Are students who receive morphological training on roots and patterns better at retaining lexical items as compared to those who do not receive morphological training? In other words, does morphological awareness of a particular Arabic word yield better retention of that word? 7. Are students who receive morphological training on roots and patterns able to benefit from their morphological awareness both in their receptive and productive vocabulary retention? In other words, is morphological awareness of particular Arabic words effective in their receptive and productive retention?	Regarding the first three research questions, it is hypothesized that beginner learners will demonstrate an ability to successfully apply knowledge of Arabic derivation morphology in their lexical inferring (research question 1) and coining (research question 2) of unfamiliar words; however, due to the low proficiency level of the participants, more gains will be evident in the inferring than in the coining ability (research question 3). It is also predicted that root and pattern training will enhance inferencing (research question 4) and coining (research question 5) ability of unfamiliar words that share roots of previously learned words. As for the last two research questions, it is expected that morphological awareness will lead to better vocabulary retention (research question 6), and that it will facilitate receptive retention more than productive retention (research question 7)... (DI17: 8)

Figure 1. Shifts from purpose statements to purpose justifications.

Second, while every research question is presented in the simple present, the converged sentence (that is, the sentence that appears as a result of the convergence) contains hypotheses presented in the simple future (for example, "will demonstrate", etc.), and each of these sentences contains anticipatory *it*-clauses (present tense) indicating a prediction (for example, "it is *hypothesized*", "it is also *predicted*", "it is *expected*") followed by an extraposed subject containing the actual hypotheses (for example, "*that* root and pattern training *will enhance* inferencing (research question 4) and coining (research question 5) ability of unfamiliar words that share roots of previously learned words").

While the aforementioned formulation of research questions exhibits a convergent pattern in the process of shifting to the postulation of hypotheses, the following segments show a one-to-one relationship between each research question and its corresponding hypothesis (see Figure 2).
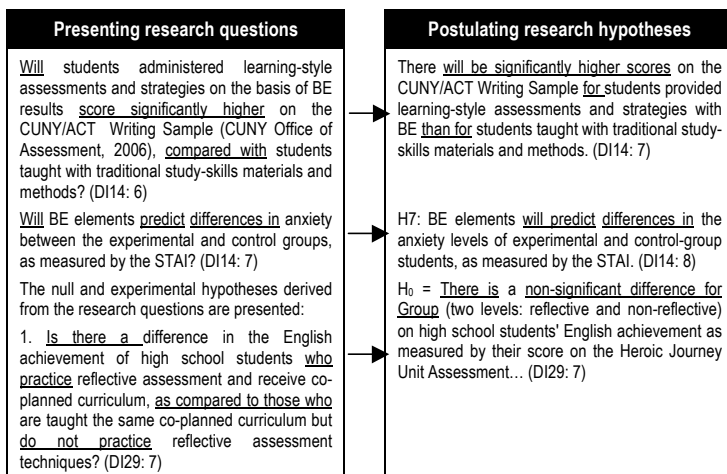
Presenting research questions	Postulating research hypotheses
<u>Will</u> students administered learning-style assessments and strategies on the basis of BE results <u>score significantly higher</u> on the CUNY/ACT Writing Sample (CUNY Office of Assessment, 2006), <u>compared with</u> students taught with traditional study-skills materials and methods? (DI14: 6)	There <u>will be significantly higher scores</u> on the CUNY/ACT Writing Sample <u>for</u> students provided learning-style assessments and strategies with BE <u>than for</u> students taught with traditional study-skills materials and methods. (DI14: 7)
<u>Will</u> BE elements <u>predict</u> <u>differences in</u> anxiety between the experimental and control groups, as measured by the STAI? (DI14: 7)	H7: BE elements <u>will predict</u> <u>differences in</u> the anxiety levels of experimental and control-group students, as measured by the STAI. (DI14: 8)
The null and experimental hypotheses derived from the research questions are presented: 1. <u>Is there a</u> difference in the English achievement of high school students <u>who practice</u> reflective assessment and receive co-planned curriculum, <u>as compared to those who</u> <u>do not practice</u> reflective assessment techniques? (DI29: 7)	H_0 = <u>There is</u> a <u>non-significant difference for</u> <u>Group</u> (two levels: reflective and non-reflective) on high school students' English achievement as measured by their score on the Heroic Journey Unit Assessment... (DI29: 7)

Figure 2. Shifts from research questions to hypotheses in the same dissertation introductions.

Figure 2 also illustrates that with the exception of hypotheses presented in "existential clauses" (for example, "Hi = *There is* a significant effect for Group …", etc.) and the anticipatory *it*-clauses (for example, "It was hypothesized that …"), all the hypotheses are presented in the simple future in direct statements regardless of whether the preceding research questions corresponding to them are in the simple future or the simple present.

The shifts in Figure 3 from "presenting a research question" to "postulating a null hypothesis" and "postulating an alternative hypothesis" also illustrate the close relationship between research questions and two different types of hypotheses:

Figure 2 is also used here to present two main points. First, in a complete cycle, a null hypothesis expressed in a declarative sentence containing a negative expression (for example, "non-significant difference", "no significant difference", etc.) is generally used with an alternative hypothesis presented in a positive declarative sentence. Second, even though null hypotheses may be expressed in either the simple present or the simple future, existential clauses in the alternative hypotheses (for example, "there is…") are usually used in the simple present.
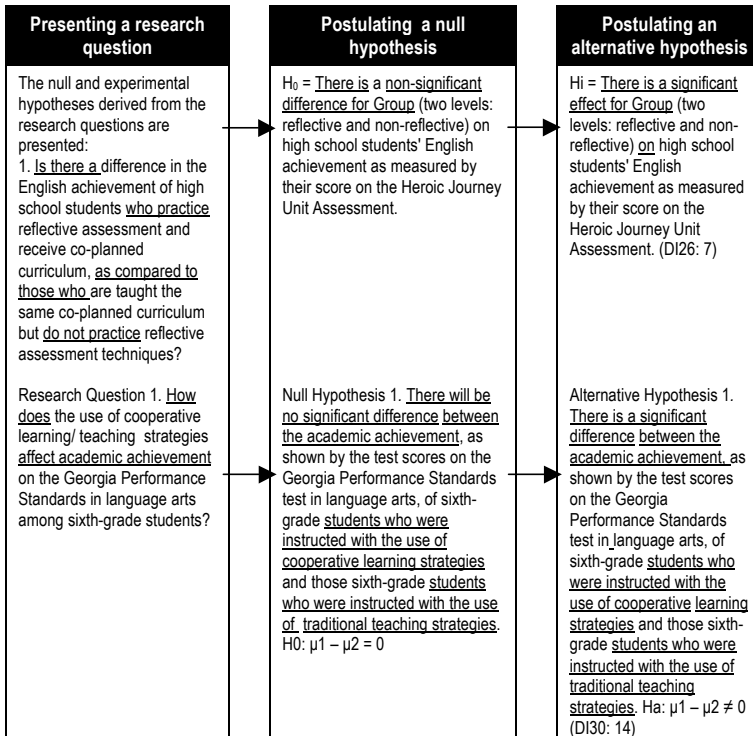
Presenting a research question	Postulating a null hypothesis	Postulating an alternative hypothesis
The null and experimental hypotheses derived from the research questions are presented: 1. Is there a difference in the English achievement of high school students who practice reflective assessment and receive co-planned curriculum, as compared to those who are taught the same co-planned curriculum but do not practice reflective assessment techniques?	H_0 = There is a non-significant difference for Group (two levels: reflective and non-reflective) on high school students' English achievement as measured by their score on the Heroic Journey Unit Assessment.	Hi = There is a significant effect for Group (two levels: reflective and non-reflective) on high school students' English achievement as measured by their score on the Heroic Journey Unit Assessment. (DI26: 7)
Research Question 1. How does the use of cooperative learning/ teaching strategies affect academic achievement on the Georgia Performance Standards in language arts among sixth-grade students?	Null Hypothesis 1. There will be no significant difference between the academic achievement, as shown by the test scores on the Georgia Performance Standards test in language arts, of sixth-grade students who were instructed with the use of cooperative learning strategies and those sixth-grade students who were instructed with the use of traditional teaching strategies. $H0: \mu1 - \mu2 = 0$	Alternative Hypothesis 1. There is a significant difference between the academic achievement, as shown by the test scores on the Georgia Performance Standards test in language arts, of sixth-grade students who were instructed with the use of cooperative learning strategies and those sixth-grade students who were instructed with the use of traditional teaching strategies. Ha: $\mu1 - \mu2 \neq 0$ (DI30: 14)

Figure 3. Complete cycles from research questions to null hypotheses and alternative hypotheses in the dissertation introductions.

3.3. Categories of research hypotheses and their linguistic features

While the linguistic features shown in the aforementioned shifts illustrate the exclusive use of the simple present in existential clauses, we may be able to gather more linguistic information via an analysis of a wider spectrum of research hypotheses presented across the corpus. RHPs are, in general, realised in two ways. The first major linguistic mechanism that doctoral candidates use has to do with direct statements in three comparatively simpler structures. The three major mechanisms constitute the most prevalent linguistic resources used in RHPs. The first structure, the simplest, requires merely a heading in the form of a noun phrase (denoting hypotheses) before the predictions are expressed in the simple future (see Table 2). While the second structure involves a brief statement of the purpose of the hypothesis before a hypothesised difference is expressed in the simple present, the third structure requires the use of past-tense verbs to introduce predictions in the

simple future or in mathematical equations. Interestingly, in all these three categories of direct statements, predictions are expressed in the simple future or the simple present so far as verbs are involved.

Syntactic choice	Instance of references to hypotheses
Providing a heading in an NP before presenting hypotheses in the simple future	Within Subjects Main Effects: Neurologically-mediated skills associated with proficient reading including phonological awareness, rapid automatic naming, visual motor integration, and vestibular/cerebellar functioning (i.e., motor coordination) will show improvement over each interval within each group. 1. Between Subjects Main Effects: Neurologically-mediated skills associated with proficient reading including visual-motor integration, phonological awareness, rapid automatic naming and vestibular/cerebellar functioning (i.e., motor coordination) will improve more for Group PANN than for Groups PA or C. 2. Within Subjects by Between Subjects Interaction Effect: Neurologically mediated skills associated with proficient reading including visual-motor integration, phonological awareness, rapid automatic naming, and vestibular/cerebellar functioning (i.e., motor coordination) will improve the most over each interval for Group PANN when compared with Group PA and Group C. Hypotheses Stated as Null Hypotheses 1. No differences will exist when comparing within-group interval means of phonological awareness skills. 2. No differences will exist when comparing between-group population means as they relate to phonological awareness skills. 3. No differences will be found when comparing group x three interval means for phonological awareness skills…(DI19: 10-11) *Hypotheses* H1: There will be significantly higher scores on the CUNY/ACT Compass Reading Test for students provided learning-style assessments and strategies with BE than for students taught with traditional study-skills materials and methods. H2: There will be significantly higher scores on the CUNY?ACT Writing Sample for students provided learning style assessments and strategies with BE than for students taught with traditional study-skills materials and methods…(DI14: 7)
Stating both the purpose of the hypothesis and the existence of a hypothesised difference in the simple present	The following null hypotheses determine the effectiveness of the READ 180 software during 2006 and 2007 and overall: Ho1a: No statistically significant mean achievement differences exist below the alpha level of .05 overall and by subgroups (English learners, SED, special education, and ethnicity) between experimental and control groups on the CST in English Language Arts; Ho1b: No statistically significant mean achievement differences exist below the alpha level of .05 overall and by subgroups (English learners, SED, special education, and ethnicity) between experimental and control groups on the CST in Word Analysis and Vocabulary Development…(DI18: 26)
Using past-tense verbs to introduce predictions expressed in the simple future or in an (in)equation	The second hypothesis was: Ha2: Adult female students who receive explicit phonics instruction will have significantly higher scores on an orthographic awareness test at the end of 16 weeks of instruction than students who do not receive explicit phonics instruction. The null hypothesis for the second hypothesis was: H02: Adult female students who receive explicit phonics instruction will not have significantly higher scores on an orthographic awareness test at the end of 16 weeks of instruction than students who do not receive explicit phonics instruction… (DI15: 16) Based on the main research questions, the hypothesis of the present study was the following: the experimental group, which received the Explicit Experienced Grammar Instruction, outperformed the control group in terms of spoken grammatical accuracy in the posttest. The hypotheses were tested at the significance level of 0.05. Ho: μ experimental, posttest accuracy - μcontrol, posttest accuracy < or = 0 H1: μ experimental, posttest accuracy - μcontrol, posttest accuracy > 0 (DI8: 12)

Table 2. The use of direct statements in expressing research hypotheses in Step 2B.

Syntactic choice	Instance of references to hypotheses
Using an SVC structure containing a *that*-clause to express a prediction in the past tense	The hypothesis was [that with oral-language rehearsal students' writing performance should increase.] (DI2: 13)
	The research hypothesis was [that Spanish-speaking students who received the enhanced VE SETR instruction would have a higher level of vocabulary development and reading comprehension when compared to a comparison group of students who received the SETR only instruction]. (DI31: 4)
Using an anticipatory *it*-clause (in either the present or past tense) to express a prediction in an extraposed subject containing a *that*-clause	For research question one, it was hypothesized [that the mean score of the treatment group would be greater than the mean score of the comparison group on the post-test measure]. Similarly, for research question two it was hypothesized that the mean score of the treatment group would be greater than the mean score of the comparison group on the generalization test. (DI3: 10)
	It was hypothesized [that students in the learning-style intervention program would demonstrate statistically higher test results, as measured by their CUNY/ACT scores in reading and writing (CUNY Test Development Program, Office of Academic Affairs, 2006)] (DI14: 5)
	Based on findings from first language (LI) acquisition research on the role of morphological awareness in vocabulary development, it is my hypothesis [that awareness of Arabic derivational morphology will indeed enhance vocabulary acquisition…(DI17: 8)
Using a predictive verb ensued by an infinitive clause or *that*-clause to indicate a prediction of an experimental effect (in the present or past tense)	The main research hypotheses were directional. Therefore, the treatment of the Explicit Experienced Grammar Instruction was assumed to have positive effects on the measured performance or zero effect at worst. Deterrents, namely negative effects, to the measured performance were predicted to be unlikely to arise. (DI8: 14)
	We expect that children with a higher level of initial English proficiency will benefit more from CR discussions on their oral and written English skills; children with lower level of initial English proficiency will be more motivated and engaged in CR discussions and have more positive attitudes toward English learning. (DI27: 22)
	To recapitulate, we expected that engaging in Collaborative Reasoning discussion would improve Spanish-speaking ELLs' oral and written English and their motivation and English learning attitudes…(DI27: 18)

Table 3. The use of indirect statements containing *that*-clauses and infinitive clauses in presenting research hypotheses.

While the first type of hypothesis mainly appears in the form of direct statements, Table 3 illustrates how doctoral candidates use intricate structures involving indirect statements containing subordinate *that*-clauses to postulate research hypotheses. These indirect statements are used to express hypotheses in three major syntactic structures. First, writers often use subject-verb-complement (SVC) structures (for example, "the research hypothesis/was/that...", etc.) containing *that*-clauses which express predictions in unison with the subsequent past-tense copular verbs (for example, "was"). Second, anticipatory *it*-clauses are often used to express predictions in extraposed subjects in the form of *that*-clauses. In this case, the modal verbs indicating predicted events (for example, "would be", "would demonstrate", "will … enhance", etc.) are always used in agreement

with the preceding main verb in the anticipatory *it*-clauses (for example, "it was hypothesized", "it is my hypothesis", etc.).

Third, the doctoral candidates often use predictive verbs ensued by infinitive clauses or *that*-clauses which indicate predictions of experimental effects in either the present or past tense (for example, "*was assumed* to have...", "*were predicted* to be...", "*expect* that...will benefit", "*expected* that ... would improve", etc).

3.4. Overall tense usage in the postulation of research hypotheses

While the results reported above have included tense usage in specific types of hypothesis postulation, some crucial questions concerning the overall usage of tenses need to be addressed here. A discussion on the views elicited from the specialist informants appears to be an appropriate starting point. On the one hand, SIA's typical "high-level advice" to doctoral candidates is that they could "use the simple past tense throughout" the introductory chapter so far as it is possible (wherever necessary). To SIA, "when you are jumping back and forth in verb tense, it is just more difficult to read", and "it flows just more smoothly if you just stick with simple past tense" in most situations requiring them. On the other hand, SIB wavered between the simple past and the simple present and would advise candidates to use either the simple present or the simple past for research hypotheses because a dissertation, unlike a prospectus, is a report on what a postgraduate student has already done.

Given that the specialist informants' recommendations differ from each other to a certain extent, it would be necessary to use the authentic instances to consider the overall frequencies of the tenses mentioned above, and find out the circumstances under which the three tenses are used. Table 1 shows that in the formulation of research questions, the simple past and the simple present are used in more doctoral dissertations compared to the simple future (even though the total number of verbs in the simple present is lower than that in the simple past or the simple future). The overall distribution of tenses therefore has furnished more conclusive statements concerning the relative importance of each major tense across the corpus. Table 1 has also shown that research hypotheses can be expressed equally commonly in the simple past or the present simple, and this can be partly understood if the informants' view is taken into consideration. When SIA said the only advice she gave was that the simple past tense should be used throughout the doctoral dissertations so far as it was possible (wherever relevant), she was

essentially referring to the use of the past tense in indirect statements for expressing hypotheses. However, when SIB preferred either the simple present or the simple past, she was mainly referring to a general tendency to use the simple present to express a general phenomenon or "state of affair" in a direct statement, and the simple past to express a prediction in an indirect statement explained above.

The detailed analysis of tense usage for hypotheses has shown that 62.5% (10/16) of the doctoral dissertations employ the simple past and the simple present respectively, while a significant proportion (50%) of them use the simple future in postulating hypotheses. Another interesting qualitative finding derived from this study is that even though both the simple present and simple future co-occur with the simple past in the presentation of research hypotheses, the simple past is mainly used in introducing, explaining, and/or justifying hypotheses in indirect statements. This means that the doctoral candidates often switch between direct and indirect statements in expressing their predictions in different portions of the same dissertation introduction.

4. Conclusion and pedagogical implications

This study has demonstrated how doctoral dissertation writers in a major Anglophone country use a repertoire of generic strategies to postulate research hypotheses in experimental research pertaining to Applied Linguistics. It has illustrated how doctoral candidates use rhetorical shifts and lexico-grammatical mechanisms to postulate hypotheses that collectively determine the tracks along which their experimental dissertations would proceed. This study has found that a vast majority of the hypotheses are placed by published dissertation writers in the medial portions after sufficient background information and literature have been presented, and this may be ascribed to the need to position their hypotheses after research questions in their dissertation introductions. Interestingly, research hypotheses appear in only half of the dissertation introductions on Applied Linguistics, the mean frequency being 0.78 hypothesis per dissertation introduction (DI), thus substantiating Swales' (2004) general statement regarding the optional and yet principal status of research hypothesis in research introductions.

The frequencies of research hypotheses do not differ across the published dissertation introductions employing the IMRD and ILMRD structures. In a

vast majority of the DIs containing research hypotheses, the appearance of hypotheses is highly contingent upon the occurrence of research questions. Given that only a small proportion of the doctoral dissertations incorporate hypotheses without research questions, it might be possible for instructors to advise learners to position a subsection containing research hypotheses after a subsection on research questions, and more specifically, instructors may show learners how research questions converge into a series of related hypotheses as demonstrated in this paper.

So far as lexico-grammatical structures are concerned, when a research question is presented in the simple present, the converged sentence usually comprises hypotheses presented in the simple future in direct statements. In some other cases, a sentence may contain an anticipatory present-tense *it*-clause indicating predictions ensued by an extraposed subject encompassing the actual hypothesis. Based on the findings reported above, when instructors guide learners to present hypotheses in direct statements, the tense to be focused on is notably the simple future regardless of whether the preceding research questions are in the simple future or the simple present. The shifts from "presenting a research question" to "postulating a null hypothesis" and "postulating an alternative hypothesis" further confirm the prevalent usage of the simple future in RHPs that involve no existential clauses. In specific cases, instructors may demonstrate to novice writers how to attain a complete cycle comprising a null hypothesis expressed in a declarative sentence containing a negative expression with an alternative hypothesis presented in a positive declarative sentence as illustrated in this paper. Nonetheless, when writers use null hypotheses, in either the simple present or the simple future, their existential clauses in alternative hypotheses are usually expressed in the simple present. Overall, writers may (i) merely employ a heading denoting hypotheses before making predictions in the simple future, (ii) use a brief statement of the purpose of the hypothesis before expressing a hypothesised difference in the simple present, or (iii) deploy past tense verbs to introduce predictions in the simple future or in mathematical equations.

As suggested by the specialist informants, the past tense is preferred to ensure a smoother flow in most situations involving indirect statements in hypothesis postulation. With respect to such indirect statements, instructors might need to devise exercises requiring learners to use three major syntactic structures, involving (i) the SVC structures containing *that*-clauses which express predictions in combination with the subsequent past-tense copular

verbs, (ii) anticipatory *it*-clauses for expressing predictions in extraposed subjects in the form of *that*-clauses, and (iii) predictive verbs ensued by infinitive clauses or *that*-clauses indicating predictions of experimental effects in the present or past tense.

In short, analysis of the overall distribution of tenses has shown that research hypotheses can be expressed equally commonly in the simple present or the simple past. The detailed analysis of tense usage in hypothesis postulation on the whole has shown that most of the doctoral dissertations employ the simple past and the simple present respectively, while half of them use the simple future in postulating hypotheses. It is therefore important for learners to be aware that even though both the simple present and simple future co-occur with the simple past in the postulation of research hypotheses, the simple past is mainly used in introducing, explaining, and justifying hypotheses in indirect statements, and writers often need to switch between direct and indirect statements in expressing their predictions in different portions of the same dissertation introduction.

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NOTES

[1] In the current study, we define "American doctoral dissertations" as "doctoral dissertations prepared for and submitted to universities in the United States of America regardless of the candidates' countries of origin".

[2] Mann-Whitney U-tests were used instead of independent samples *t*-tests although the number of occurrences is a ratio variable because the occurrences were not normally distributed for all the constituent steps.