The use of source texts in academic writing has been explored in at least two groups of EAP studies, those on the reading-writing connection in student writing and those on citation practices in disciplinary discourse. In recent years, there have been a growing number of studies on the rhetorical functions of intertextual links in different academic genres such as research articles and theses, and studies have also compared citation use by novice and more established writers. Following a brief analysis of citation forms, this article explores the functions of source text use in the discussion sections of master’s theses and research articles from biology using two typologies, one created by Thompson (2001, 2005) and, the second, an expanded model described in this paper, which reflects the rhetorical progression of this part-genre. Previous genre studies have only referred to the use of literature in one move in discussions, “commenting on results.” However, the results of this study show that intertextual links are used for a variety of rhetorical functions throughout discussions in master's theses and journal articles. This article concludes with a discussion of implications from this study for the EAP classroom to facilitate the development of advanced second language writers.
writing task (whether a summary or an opinion piece) and the L1 of the writers, where L2 writers of English failed to provide explicit attribution for textual borrowing. However, this difference in source use in task types was not evident in an earlier study by Greene (1993), which sought to explore broader issues in learning variation across different sorts of writing tasks. Further, researchers have pointed out that ESL students may not adopt the necessary critical stance toward source texts in their academic writing (Abasi, Akbari, & Graves, 2006; Bloch & Chi, 1995).

A noteworthy group of studies within the area of the use of source text in academic writing is those that have focused on graduate students to explore questions such as how students learn to use citations in their doctoral theses and the construction of certain author identities through the use of source texts. Dong (1996) explored the evolving nature of source texts in four Ph.D. students’ doctoral dissertations as they produced multiple drafts of their introductions under the guidance of their advisors. This case study highlighted some of the difficulties that graduate students had in integrating source texts with the new claims they were making, findings that are somewhat similar to those from Berkenkotter and Huckin’s (1993) case study of the use of citations by a scientist producing multiple drafts of a research article for publication. Further, more and less experienced writers’ use of source texts can also lead to the construction of different author identities such as an identity that is one of “solidarity and alignment” with the instructor’s perspectives or, in contrast, an identity as a “plagiarist” and not as an author, according to a study conducted by Abasi et al. (2006, p. 108, 111). These studies exploring the use of source texts in academic writing have clearly shown the importance of this area of study for pedagogical purposes beyond issues of plagiarism or language re-use (Flowerdew & Li, 2007) that have also been addressed in EAP research.

The second body of research attending to issues of intertextuality, perhaps more explicitly, is the growing number of studies on the use of citations in academic writing particularly in published research articles (such as Bazerman, 1988; Hyland, 2000; Swales, 1986). Studies by Berkenkotter and Huckin (1993) and Myers (1990), for example, have pointed to the role that references to previous research play in authors acknowledging their dependence on previous developments in the discipline for their own new and original claims. Citation practices can vary in interesting ways across disciplines as shown by studies analyzing the reporting verbs used, whether citations are integral or non-integral, and the way the cited material is incorporated into the new text as summary, quotation or paraphrase (Charles, 2006; Hyland, 1999, 2000). Further, citation practices can also vary across cultures, posing major challenges to L2 writers (Bloch & Chi, 1995). Given the rhetorical and linguistic complexity of using citations in academic writing and the inherent challenges to mastering appropriate citation usage, some recent studies have focused their attention on citation use in graduate student writing with a view to informing EAP writing instruction.

Thompson (2001, 2005) and Thompson and Tribble (2001) have considered citation use in Ph.D. theses across disciplines and across different sections of Ph.D. theses from one discipline. These studies have not just focused on the syntax for citing (for example, if a citation is integral or non-integral) but have also considered the rhetorical function of citation use in these texts, using some broad categories such as “source of proposition” and “origin of theory, technique or product.” A recent study by Petrić (2007: 248) has compared function of citation use in high and low-rated master’s theses in gender studies, concluding that the low-rated theses tended toward “descriptiveness rather than analysis” in their use of citations. Another recent study (Mansourizadeh & Ahmad, 2011) has also compared citation function in papers written by master’s students (in engineering) and published research articles, revealing a less sophisticated use of citations by students. Citation function can also vary across different writing tasks performed by postgraduate students in one discipline, as shown by Petrić and Harwood (2013).

The discussion section of the master’s thesis has been said to be especially challenging for students because of the need to establish relations between previous literature and the results of the study being reported (Bitchener & Basturkmen, 2006). As Thompson (2005) notes, citations have a high density in discussions (as well as introductions) of dissertations and we can surmise that the same might be true for master’s theses and that reference to previous research might fulfill a number of rhetorical roles in this part-genre. It should be noted that, although research-based EAP materials such as the exemplary volumes by Swales and Feak (1994, 2000) and Feak and Swales (2009, 2011) pay careful attention to the construction of intertextual links in student writing in introductions and literature reviews, not as much is said on the use of citations in discussion sections. Previous analyses of the discussion sections of research articles in terms of rhetorical moves and steps (such as Yang & Allison, 2003) have acknowledged reference to previous research explicitly only in one move, “commenting on results.” Yang and Allison (2003) note the use of literature in the step referred to as “comparing results with literature” and also state that previous research can be used in the step “interpreting findings,” both from the same move, “commenting on results.” In addition, Basturkmen (2009) in her study of the move, “commenting on results,” in discussion sections of master’s theses, has shown reference to previous literature being used in explanations for a result. In an earlier analysis of the macro-organization of master’s theses (Samraj, 2006, 2007), it became clear that student writers do not merely refer to other research in order to compare their results with those from relevant and similar studies, although comparing results is an important function of referring to previous research.

Studies aiming to uncover practices in advanced student writing are needed given the relative paucity in genre analyses of such student writing (Swales, 2004) and the importance of such studies in informing EAP instruction (Dudley-Evans, 1999). Recent studies of the structure of student-produced genres such as Ph.D. dissertations (Paltridge, 2002; Thompson, 1999,

1 Numerous citation studies have also been conducted in information science. See Harwood (2009) and White (2004) for helpful overviews.
2005) and master’s theses (Charles, 2006; Koutsantoni, 2006; Samraj, 2008) have led to discussions of the overall structure of such genres in EAP texts (Paltridge & Starfield, 2007; Swales & Feak, 1994, 2000).

Because of the general dearth of studies of master’s theses (Samraj, 2008), the challenging nature of the writing of discussion sections in master’s theses for L2 students (Bitchener & Basturkmen, 2006, p. 7) and the importance of citations in discussion sections (Thompson, 2005), the study reported in this paper analyzes the use of citations in discussion sections of master’s theses and in corresponding sections in published research articles in Ecology, a sub-discipline of biology, and is part of a larger study of master’s theses from three disciplines, biology, philosophy, and linguistics. These disciplines were selected as representative of the sciences (biology), social sciences (linguistics) and the humanities (philosophy). Theses and research articles from biology are used in this comparative study because master’s theses and research articles bore the greatest similarity in overall organization in this discipline in terms of Introduction–Methods–Results–Discussion structure. Since the focus in this paper is citation use in a particular rhetorical section of the two genres, biology texts were selected because they entailed the least amount of variation in text structure and enabled a clearer focus on citation use. The theses and research articles were limited to those from one discipline because the study’s focus is not disciplinary variation in citation use.

Previous studies have compared master’s theses and research articles (such as Basturkmen, 2009), even if research articles may not be the benchmark for master’s theses since such comparisons can shed light on the relationship between these two genres and enhance our understanding of the master’s thesis. The goal of this study is to explore the forms of citations and their rhetorical functions in these student and published texts in order to contribute to a taxonomy of citation uses, informed by previous taxonomies (such as those proposed in Harwood, 2009; Petrić & Harwood, 2013) that can be used in graduate-level EAP courses with the goal of facilitating L2 students’ successful construction of genres such as master’s theses and Ph.D. dissertations. A secondary goal is to look for possible variation in citation use between novice and experienced writers in this discipline. As such, it is hoped that the results of this study would be used in the construction of further instructional materials for graduate students and junior scholars, following the call by EAP scholars such as Harwood (2004) and Thompson and Tribble (2001) for materials focusing on citations beyond mechanistic or superficial features. Such materials could also benefit English L1 novice writers as they acculturate into disciplinary communities.

2. Method

The study reported in this paper uses both genre analysis and specialist informant interviews. Eight theses from biology (ecology) produced as part of a master’s program in a large public university in the United States (U.S.) and eight research articles randomly selected from the journal Ecology, said by content specialists to be the model used by students for their theses at this institution where the theses were produced, constituted the data set used in this study. Two specialist informants with extensive experience supervising theses from the Department of Biology were interviewed regarding their views on the structure and function of the master’s thesis in this field. Each interview lasted around 60 min and was tape-recorded and transcribed. These semi-structured interviews focused both on general issues such as how theses were evaluated in this discipline and more specific issues such as the structure of the introduction. These specialist informant interviews, however, only provide supplementary data for the current study.

The master’s theses produced in U.S. universities normally are not assigned a grade (cf. Petrić, 2007) and as one specialist informant from the Biology Department stated, when asked about poor theses, “they (the students) just have to keep rewriting it till it gets there.” As such, the theses analyzed can all be considered successful exemplars of the genre.

The foci of the analysis in this study are the formal characteristics of citation use, such as whether they are integral or non-integral, and the rhetorical functions served by the citations. Two analyses of rhetorical functions were conducted. I first analyzed the citations using Thompson’s (2001) sub-classification of integral and non-integral citations to consider the functions of citation use. Thompson’s taxonomy (Thompson, 2001, 2005; Thompson & Tribble, 2001) ascribes broad functions to citations, with a different set of function labels for integral and non-integral citations. He proposes four subcategories for non-integral citations: source, identification, reference and origin. Under the function of source, he includes citations that attribute an idea or findings to another author. The function of origin is ascribed to citations that provide the origins of a concept or product. Since concepts couldn’t always be distinguished from ideas and there was a rather low occurrence of citations that referred to the origin of a product in the texts analyzed here, these two functions were collapsed and just referred to as source. A citation is analyzed as having the function of identification when the citation, through verb choice such as “has been suggested”, identifies the cited author(s) as the agent(s) of the action. The function of reference is ascribed to citations where the reader is directed to the citation being provided for further information, often with directive verbs such as “see.” Within integral citations, two main functions are provided. Verb controlling citations are those where the citation functions as the semantic agent in the sentence through the use of either the active or passive voice, for example, “Selander (1964) considered nine characteristics of size and six characters of plumage pattern and color,” where “Selander (1964)” is the agent in the sentence. In other cases referred to as naming integral citation, the citation, although part of the sentence, has a slightly backgrounded role, being part of a nominal group, as in “The scoring system of Rea and Weaver (1990, see Table 1) would predict that birds of this subspecies would be scored at ...”. The third type of integral citation, non-citation, where a name is given without a year of reference, was not found in my data.

A second more detailed categorization of the rhetorical functions of citations influenced by the rhetorical organization of discussion sections is then proposed and employed in this study. Although this typology is what is referred to as a content-based typology (Petrić, 2007) and cannot always be extended to other disciplines, it is believed that it can be used in
describing the rhetorical functions of citations in academic writing from other disciplines that are also empirically based. The second set of functions proposed is not dependent on citation form as in Thompson’s (2001) original classification. This is because the form of a citation (for example, whether it is integral or non-integral) does not have a bearing on the citation’s rhetorical function, although a study of possible correlations between form and function might yield interesting results.

A few recent studies on citation use in academic writing have expanded on the functions provided in Thompson (2001, 2005) and Thompson and Tribble (2001). The functions for citation use identified in these studies were consulted and inform the taxonomy presented here. One such study by Petrić (2007) includes nine rhetorical functions, which are shown to be useful in differentiating source text use in high- and low-rated master’s theses from the field of gender studies. Some of the functions identified, such as comparison of one’s findings with other sources, in this study of the whole thesis were relevant for the analysis of my data of discussion sections while some functions such as attribution and exemplification turned out not to be as useful because of their generality or rarity of occurrence. Another more recent case study by Petrić and Harwood (2013) of one L2 post-graduate student writing in two courses in management studies also offers a taxonomy of citation functions based on structured interviews with the student writer. Interestingly, some of the functions identified were not found in the discussion sections analyzed here due to differences in the discipline and nature of writing task. For example, the function of topic relevance was not found because the communicative function of discussions does not include that of justifying the writer’s choice of topic. Other citation functions such as agreement and disagreement, where citations are employed to express the writer’s disagreement or agreement with ideas bear some resemblance to the function “comparison of results” in the taxonomy offered below, while simultaneously reflecting differences in the communicative purpose of academic writing in different settings. It should be pointed out that the present study is not concerned with functions such as advertising (Harwood, 2009), which concern establishing interpersonal relations in disciplinary communities, and can be best identified through interviews with writers, because the focus of this study is more on the textual function of citations. It is conceivable that a citation that fulfills the function of advertising others’ work can also at the same time provide a comparison of results.

The functions of citations in my data were determined by considering not just the sentence in which the citations appear but also the surrounding sentences. Although it must be acknowledged that the real author intention for using a citation cannot be accurately determined by just considering the text surrounding a citation (Harwood, 2009), it is possible to propose the rhetorical functions of citations by considering the discourse within which they appear. The texts were read and analyzed a number of times in order to arrive at a list of possible functions for citation use in discussion sections of biology theses and research articles. This is what Barton (2002) refers to as an “inductive discourse analysis,” where the texts are repeatedly read till patterns emerge. The list of citation functions was revised as more texts were analyzed to better capture the range of functions and distinguish one function from another. The texts were then analyzed again with the finalized taxonomy.

In addition, unlike methodologies in some previous studies (such as Petrić, 2007), where each citation was assigned a function and the total numbers calculated, in this study, I assign a rhetorical function to one or multiple citations which appear together. There can also be more than one such citation location in a sentence. This categorization is similar to that used by Mansourizadeh and Ahmad (2011, p. 154), where the frequency of occurrences of citations is independent of whether each citing location contains a single or multiple citations. An earlier study by Bloch and Chi (1995: 241) also used a similar system to calculate citation strategies. In this system, both sentences below will be analyzed as containing one case each of citations being employed to compare the reported findings with previous findings although in the first sentence only one citation is given, while, in the second, two citations are given. Although this could be argued to lead to misleading results in terms of number of references used, this method of calculation does better capture the number of places in a text writers deem it important to make an intertextual link to previous discourse or simply “when a citation is called for” (White, 2004: 107).

1. The results of the reanalysis of the morphological data and the genetic study do not support the designation of the subspecies C. b. sandiegensis as proposed by Rea and Weaver (1990). (MA 1: 37)
2. The finding of no EPP in vireos is lower than found in most passerines (Table 2)… Passerines with higher levels of EPP include indigo buntings (Passerina cyanea) and eastern kingbirds (Tyrannus tyrannus; Mckitrick, 1990; Westneat, 1990). (MA 3: 18)

The discussion sections of the master’s theses are longer (18, 888 words) than the discussion sections in the research articles (13, 169 words). It should be pointed out that one research article has a separate conclusion section following the discussion section while two research articles have a sub-section labeled conclusion or concluding remarks within the discussion section. Two master’s theses include conclusions within the discussion chapter, the last chapter of the thesis. Since, in 15 out of the 16 texts, the discussion section or chapter includes everything that comes after the results section or chapter, whether or not it includes a subordinate conclusions section, it was decided that the separate conclusions section in one research article would also be included in the analysis. It would appear that the discourse functions being fulfilled in this labeled “conclusions” are being fulfilled within the discussions in the other 15 texts.

2 In fact, most of the recently published studies on the functions of citations (Mansourizadeh & Ahmad, 2011; Petrić, 2007; Thompson, 2001) did not arrive at the functions by interviewing authors.
3 The information in parenthesis indicates if the excerpt is from a master’s thesis (MA) or research article (RA), its number in the data set, and the page number where the excerpt appears in the original text.
Although this study is mainly qualitative in its focus and doesn’t employ a large corpus such as those employed by some studies of citation use in published academic writing (for example, Hyland, 1999), some quantitative analyses were performed. The percentages of integral and non-integral citations and their sub-categories following Thompson (2001) and Thompson and Tribble (2001) were calculated. The number of citations per 1000 words was computed for comparison across the two sets of texts. The different rhetorical functions of references to previous research were analyzed using the proposed typology (discussed below) and the total number of instances of each rhetorical function was counted for discussion sections from the master’s theses and research articles. Both the number of citation types per 1000 words and the percentage of each citation type for each genre were calculated to determine which were common citation functions. It is hoped that the comparison of frequencies of the rhetorical functions will provide a preliminary understanding of any differences and similarities across citation use by students and published authors as well as the relative importance of certain rhetorical functions of citations in a particular genre. The main aim of this analysis is to arrive at an understanding of the range of rhetorical functions fulfilled by references to previous research in this part-genre of academic discourse.

3. Results and discussion

The texts were analyzed using two different frameworks for citation function following an initial categorization of citations as being integral or non-integral, using Swales’ (1990) formal distinction between citations that are sentence internal and those that are sentence external with no grammatical function in the sentence.

3.1. Analysis of citation form

Table 1 presents the results from the analysis of citation form. It is not surprising that both sets of writers, experts and novices alike, make use of more non-integral citations than integral ones since previous research has identified non-integral citations as the preferred citational form in academic writing in the sciences (for example, Hyland, 2000). Charles (2006) found that student writers in two disciplines, politics and materials science, used a greater number of integral than non-integral citations in their theses, which was not the case here, but her study only considered reporting clauses and did not provide an analysis of all citations in the theses. The student writers in this study tend to use integral citations more frequently than the published writers, indicating a preference for granting prominence to individual authors. What is also noteworthy is that the percentage of integral citations is higher in the discussion sections than in the introductions of these same biology theses, where only 12% of citations were integral compared to 27.9% in the discussions, showing that citation use can vary across parts of the same genre which fulfill different discourse functions (see Samraj (2008) for results from an analysis of master’s thesis introductions).

<table>
<thead>
<tr>
<th></th>
<th>Master’s theses</th>
<th>Research articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integral citations</td>
<td>63</td>
<td>34</td>
</tr>
<tr>
<td>Non-integral citations</td>
<td>163</td>
<td>149</td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>183</td>
</tr>
</tbody>
</table>


The results of the analysis using this framework shed some interesting light on citation use by student writers and experts in biology and are provided in Table 2. Although the student and the expert writers are similar in the sub-categories preferred within integral and non-integral citations, there is a difference in degree in their preferences. That is, although both student and published writers have more verb-controlling integral citations than naming integral citations in their discussions, the student writers use verb-controlling integral citations (which constitute 21.2% of all citations) much more than the published writers (which are 12.6% of citations). And, although non-integral reference citations are the smallest category of citations in both sets of texts, they are five times more prevalent in the published research article discussions (4.9%) than in the student thesis discussion chapters (0.9%).

<table>
<thead>
<tr>
<th></th>
<th>Master’s theses</th>
<th>Research articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-integral source</td>
<td>52.2</td>
<td>56.3</td>
</tr>
<tr>
<td>Non-integral identifying</td>
<td>19.0</td>
<td>20.2</td>
</tr>
<tr>
<td>Non-integral reference</td>
<td>0.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Integral verb-controlling</td>
<td>21.2</td>
<td>12.6</td>
</tr>
<tr>
<td>Integral naming</td>
<td>6.6</td>
<td>6.0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Both non-integral naming citations and verb-controlling integral citations have a somewhat similar effect in pointing to the agentiveness of the cited author(s), although that author has a larger presence in the text with the use of integral citations (example 4) as seen in the following examples:

3. The presence of hilly terrain between foodplant patches has been suggested as a factor inhibiting the colonization of new patches for *E. editha bayensis* (Harrison, 1989). (MA 5: 72)

4. Selander (1964) suggested that the ancestral cactus wren is most closely represented by *C. b. affinis* of Baja California Sur. (MA 1: 34)

Student writers foreground previous research to a greater extent by ascribing cited authors with semantic roles in the sentence such as subjects in active voice sentences (example 4 above). In research article discussions, previous research tends not to be given textual prominence but embedded within the research article writer’s own claims.

A limitation of this framework is the difference in sub-categories for the two forms of citation, integral and non-integral. We can argue that similar rhetorical functions might be served by both kinds of citations. For example, the function of giving the source of an idea or concept can be accomplished by integral citations as well as non-integral citations. This framework was created to reach a greater understanding of the sorts of integral and non-integral citations found across genres and disciplines in academic writing (Thompson & Tribble, 2001) and it serves this purpose well. However, to reach a better understanding of the rhetorical functions served by citations in discussions of results, the categories within the framework need to be expanded. Citations are used in academic writing to provide the source of an idea but these source citations may serve different and complex functions such as providing support for the negative evaluation of a methodology or support in interpreting a current finding. A taxonomy of citation functions that attempts to capture such nuanced uses is described in the next section.

3.3. Analysis of citation function with an expanded framework

Although there are a greater raw number of locations where citations are presented in the master’s thesis discussions, there is a lower number of citations per 1000 words in these thesis discussions, indicating a lower density of citation use (see Table 3).

3.3.1. Citation functions

A total of eight functions were identified and were used to varying levels in the two sets of texts, as will be discussed below.

3.3.1.1. Comparison of results. The most obvious function of use of source text in discussions in research articles and master’s theses is to provide a comparison with the current results being reported, as seen in Table 3. As mentioned earlier, this function of intertextual links has been made explicit in the overall organization of the discussion section (such as Yang & Allison, 2003). Authors refer to other studies to show either support for their findings or a lack of alignment of their findings with earlier research (see excerpts 1 and 2 above). These comparisons can be either made explicit or left implicit as seen in excerpt 5 below from a research article. The comparison is made explicit with the first reference to a previous study, “Bernardo (1994),” with the words “but unlike this study” whereas the comparison of results is to be inferred with the second reference:

5. Bernardo (1994) performed a common garden study on multiple populations of the salamander *Desmognathus ochrophaeus* and found that food enhancement increased growth rates, but unlike this study, the age of maturation was fixed. Ford and Seigel (1994a) found that neither age nor size of first reproduction was fixed in the oviparous corn snake *Elaphe guttata*; food enhancement resulted in either earlier maturation, or larger size at maturation. (RA 5: 2322)
Interestingly, intertextual links used to compare results are more frequent in the research articles than in the master’s theses (see Table 3) and constitute the largest and second largest proportion of citation type in research articles and master’s theses respectively (see Table 4).

3.3.1.2. Interpretation of findings. Beyond comparisons of results, the authors can also draw on previous research to interpret their findings or to provide support for interpretations of their findings. This is seen in excerpt 6, where the student writer provides an interpretation of her findings, that evolution of certain characters can proceed independently, before stating previous findings that support such an interpretation. And finally at the end of the paragraph (a number of sentences have been ellipsed in the interest of space), she uses the voice of other researchers to echo the interpretation she herself had reached earlier about the evolution of these patterns:

6. The apparent lack of overall concordance among genic, choromosomal, and morphological characters in Saimiri suggest that evolution of such characters may proceed independently. Recent studies support the independent evolution (mosaic evolution) of morphological, choromosomal, and genic characters. Chromosomal differences in conjunction with little or no electrophoretic divergence have been observed in morphologically similar races of Sorex araneus (Frykman et al., 1983), Thomomys bottae (Hafner et al., 1983), Spalax ehrenbergi (Nevo and Cleve, 1978), Proechimys quaire (Benado et al., Reig et al., 1979) and Uroderma bilobatum (Baker, 1981; Greenbaum, 1981)… Based on phenotypic similarity among genetically divergent sapsuckers, Johnson and Zink (1983) concluded that the evolution of genic and external phenotypic patterns can clearly proceed independently. (MA 8: 45)

As mentioned earlier, Yang and Allison (2003) also stated that references can be made to the literature in the step “interpreting results” in their discussion of the structure of research article discussion sections. Drawing on previous research in order to interpret or generalize from one’s own findings appears to be a more sophisticated use of the literature than a simple comparison of results. However, it is not the case that the published texts include a much greater frequency of citations serving this function (see Table 3). In fact, a smaller percentage of citations in the research articles have this function compared to the percentage of such citations in the master’s theses (see Table 4).

Interestingly, in the research articles, intertextual links are not just established to interpret the authors’ own findings but references to other research are also made so that the authors can interpret the results of other studies, a slightly different function from drawing on other texts to interpret one’s own findings, although these have been included in the same category:

7. Werner and Glennmeier (1999) found that closed-canopy ponds at the ESGR have dissolved oxygen concentrations of \( \leq 2 \text{ mg/L} \) during the summer. These concentrations are lower than those shown to induce anuran larvae to bob at the surface for oxygen (Wassersug & Seibert, 1975). Coupled with these physical differences are apparent differences in food resources between closed- and open-canopy ponds (D.K. Skelly, L. K. Freidenburg, and J.M. Kiesecker, unpublished data). In these ponds, it appears that variations in food resources across the canopy gradient may have important effects on growth and survivorship of some anuran species (Werner & Glennmeier, 1999). (RA 6: 2334).

In excerpt 7, the author arrives at a generalization based on other findings (all to do with differences between canopy gradients in ponds) and the tentativeness in the interpretations of other research is clearly manifested in lexical choices such as “appears,” “may” and “some” in the final sentence in this excerpt. Although there are a couple of instances where references are made to other research in the master’s theses in order to interpret the findings of previous studies, this does not occur as frequently as it does in the research articles. This is not surprising, given the disciplinary expertise and authority needed to extrapolate interpretations from the findings of others.

3.3.1.3. Explanation of results. As indicated in earlier analyses of research article discussions (such as Yang & Allison, 2003), authors provide explanations for the kinds of results found, especially if they are unanticipated. In all of the master’s theses, the authors draw on previous research to explain their findings when explanations are warranted. Excerpt 8 below presents a case where the use of previous research for this rhetorical function is made explicit. A generalization from previous findings is given first and this is then used to explain the lack of correlation that was expected in the current study.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Frequency of citation functions in master’s thesis and research article discussion sections in percentages.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master’s theses</td>
</tr>
<tr>
<td>Comparison of results</td>
<td>29.2</td>
</tr>
<tr>
<td>Interpretation of results</td>
<td>31.4</td>
</tr>
<tr>
<td>Explanation of results</td>
<td>12.8</td>
</tr>
<tr>
<td>Evaluation of study</td>
<td>4.0</td>
</tr>
<tr>
<td>Evaluation of field</td>
<td>8.0</td>
</tr>
<tr>
<td>Research recommendations</td>
<td>4.0</td>
</tr>
<tr>
<td>Applied recommendations</td>
<td>7.5</td>
</tr>
<tr>
<td>Background</td>
<td>3.1</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
conducted at Paradise Creek marsh. It should perhaps be pointed out that in Thompson's (2005) system these non-integral citations would have been coded as those indicating the source of a proposition. However, by considering the context of the citations, it is clear that the source texts are being drawn on to explain the lack of correlation in the student's findings:

8. Salicornia virginica competes with Spartina foliosa for nitrogen, reducing the ability of Spartina to increase in biomass in response to nitrogen enrichment (Covin, 1984; Covin & Zedler, 1988). This interference with Spartina biomass could explain the lack of correlation between Prokelisia abundance and Spartina biomass in experimental plots at Paradise Creek marsh. (MA 2: 54)

As seen in Table 3, the use of intertextual links to explain research findings appears more frequently in the student texts (1.54 instances per 1000 words) than in the published research articles (1.06 times per 1000 words). In fact, citations that serve this function only comprise 7.7% of all citations in the research article discussions compared to 12.8% of citations in the student texts. This in part could be due to the students’ studies yielding unexpected results needing explanations more so than those in the published studies.

The majority of citations are used for the purposes described above, namely, to compare present findings with previous findings, to interpret current and, to a smaller degree, other findings, and to provide explanations for findings. In fact, citations that serve these three functions constitute 73.4% and 73.3% of all citations in the research article discussions compared to 12.8% of citations in the student texts. This in part could be due to the students’ studies yielding unexpected results needing explanations more so than those in the published studies.

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3.3.1.4. Evaluation of study. Citations in both the student theses and research articles perform a few other important functions. One interesting function is that of evaluating the study being reported and citations can be used to strengthen either the positive or negative evaluation presented. In excerpt 9, the positive evaluation of the quality of samples used is no doubt accentuated by the citation that highlights the challenging background for sampling, that is, the hybridization present in the species:

9. Although hybridization is widespread among North American species of Bufo (Blair, 1972), samples from this study were all taken from purportedly “pure” populations, thus minimizing phylogenetic “noise” from interspecific breeding. (MA 7: 33)

Another example of evaluation of the study, again in terms of the methodology employed, is given in excerpt 10:

10. The use of band sharing proportions was not as effective as minisatellite fingerprinting... Random adult band sharing and parent-offspring band sharing did not fall into two discrete distributions, as was found in Westneat (1990) using minisatellite fingerprinting. This could have made it difficult to determine whether an extra-pair offspring was the result of an EPC or a result of IBP. (MA 3: 22)

Here, in contrast to example 9, the evaluation is negative. The citation in this case serves as a contrast, emphasizing the limitation of the methodology employed by the student author. Specific results of a previous study that used a different methodology, “minisatellite fingerprinting,” are compared to the student’s limited results. This comparison is used as a support for the student’s claim regarding his own methodology being “not as effective.” This example illustrates, to a certain degree, the complexity that can be involved in source text use in academic writing. What might appear to be just a comparison of results with a previous study in fact has the purpose of evaluating the study’s methodology. Interestingly, the same student also points out the advantages of the method he employed on the same page, but does not use citations to support or develop his claims for the positive elements, as seen below:

11. An advantage of the technique used in this study, over minisatellite fingerprinting is that small quantities of DNA are sufficient to produce a multi-locus fingerprint. For this study, this was essential, as feathers with only a small amount of DNA were collected. (MA 3: 22)

The construction of intertextual connections for the evaluation of a study is also found in research articles. In excerpt 12, a citation is used to temper the authors' self-criticism of their methodology. Problematic aspects of a study seem to be made less problematic by reference to other research:

12. Generally speaking, the problem of realism in extrapolation occurs in all ecological studies (particularly experiments) and is not unique to experimental model systems such as ours (With, 1997b) (RA1: 2268).

In essence, the reference to other research functions as a hedge of the negative evaluation constructed.

The research article authors also use citations to show their study’s contribution to the field as a whole, as seen in excerpt 13. Through reference to previous research, the authors are able to solidify a claim regarding their contribution to the disciplinary conversation:
13. Even though trees suffering a growth decline may have been predisposed to be killed or severely damaged by magmatic degassing, our study adds a new facet to previous investigations of volcanic phenomena causing abrupt changes in tree rings (e.g. LaMarche & Hirschboeck, 1984; Smiley, 1958). (RA 8: 2425)

This statement of the contribution of their study, that it “adds a new facet” is similar to the rhetorical move of positive justification that has been identified in the second move of research article introductions (Samraj, 2002). Interestingly, this is the very last sentence in this research article and so it seems that citations are not just used in introductions to situate the study within the larger field but can also be used at the end of these texts to emphasize how the reported study fits within the larger disciplinary narrative. In evaluating their studies, none of the student authors construct intertextual links to evaluate their thesis research in terms of its value to the discipline as a whole.

3.3.1.5. Evaluation of field. Somewhat related to the above use of citations is the next use, where citations are employed in the evaluation of the general area of inquiry or field as a whole (and not just the study reported). Such evaluations are mostly in terms of what state the field is in, and, perhaps, surprisingly, gaps in the general area are pointed out. An example is 14 below, where the author gives a synopsis of the state of the field at the end of the article:

14. Much attention has been paid to the theoretical implications of reproductive costs on the evolution of life histories, particularly survival costs (reviewed in Reznick, 1985; Roff, 1992; Stearns, 1992). Comparatively few studies have assessed survival costs directly, as most evidence found to support reduced post-reproductive survival has been circumstantial in nature (Roff, 1984). (RA 4: 2312)

The evaluation of the field constructed through intertextual links resembles an evaluation of the state of the field in the rhetorical organization of research article introductions, which often creates a research space for the study being reported. Again, citation use to evaluate the field was mostly found in the research article discussions and not those from the master’s theses. In fact, one master’s thesis contained almost all the instances of such citation use. So, although the total percentages of citations devoted to this use appear similar in both sets of texts (see Table 4), this figure creates an inaccurate impression of the spread of this citation function in the theses.

3.3.1.6. Applied recommendations. Research article and master’s thesis discussions often include applied or research recommendations. Although conservation or management recommendations, which are categorized as applied recommendations, are only found in the student texts, it is noteworthy that the student authors make use of intertextual links to construct these obligations for action in the world or “field obligations” imposed on the reader (Giltrow, 2005). The link to previous research can have a direct bearing on the recommendation as in excerpt 15, where a specific part of the recommendation comes (that is, that the cacti be at least 4 feet tall) from a source text, or it may serve as the research basis for the real-world recommendation suggested, as in 16.

15. If a management plan for a coastal population of cactus wrens includes a translocation, ecological as well as genetic factors should be considered. The proposed translocation site must contain sufficient tall Opuntia cacti (four feet or taller, Rea & Weaver, 1990) to allow the birds to select sites for roosting and breeding nests. (MA 1: 38)

16. The “cleaning out” of forest ecosystems through elimination and decomposition of weakened and dying branches is an important ecological recycling process, since it speeds up the necessary re-introduction of nitrogen back into the forest ecosystem (Deyrup, 1981). Therefore, pest control directly aimed at some buprestid beetle species may not only be unnecessary, it may be undesirable in revegetated ecosystems. (MA 6: 53)

3.3.1.7. Research recommendations. Intertextual links are also established as the basis of research recommendations made. Citations in research articles serve this function almost twice as often as those in the master’s theses (0.91 per 1000 words versus 0.48 per 1000 words). A reference to source texts can serve as the reason for the recommendation being made as in excerpt 17, where the author links his suggestion to the findings of previous studies. The intertextual link also can serve as a reference to methodologies of other studies that the author suggests need to be employed in further research as in excerpt 18.

17. Some insect populations have been shown to incorporate introduced weeds (Bowers et al., 1992) and introduced crop plants (Hsiao, 1978) into their diets. The diet breadth of introduced insects, especially those imported for biocontrol purposes, should be examined to determine their potential for feeding on economically valuable or ecologically sensitive plants. (MA 5: 74)

18. Now that primers have been developed for the mitochondrial control region in cactus wrens (Zink per. Comm.), this study should be repeated using the more variable region. (MA 1: 37)
3.3.1.8. **Background.** There are also some references that were analyzed as providing background information. References with this function are not very frequent because most references were ascribed more specific functions than one of providing background information within the proposed taxonomy. In the example below, the student writer provides citations to present background generalizations in the first sentence before embarking on a general description of the results found in her study in the second. The third sentence in the excerpt below contains a citation with the function of comparison of results, with some specific results from the thesis study given in the last sentence:

19. Elevation is a feature of salt marsh systems that can affect vegetation structure and invertebrate abundances (Cammen, 1976; Foster & Treherne, 1976; Rutherford, 1989). *Spartina* cover and biomass, and *Prokelisia* and *Coleomegilla* abundances varied among Paradise Creek microhabitats according to elevation. Stiling et al. (1982) found leafminer densities to be significantly higher in *Spartina alterniflora* plants along the shoreline of the marsh than they were in more inland areas .... In my study, the areas of highest *Prokelisia* abundances were also shoreline plants. (MA 2: 55)

4. **Concluding comments**

The analyses of intertextuality in discussion sections in master’s theses and research articles have shown variation in both form and function of citations. The analysis of citation form revealed that previous research is not foregrounded through use of integral citations in writing in biology whether it is student or published writing, supporting the results of earlier studies. Instead, most research is backgrounded through non-integral citations. However, master’s thesis writers seem to use grammatical structures that focus attention on the authors of previous research a little more through greater use of integral verb-controlling citations and non-integral identifying citations.

This analysis of intertextuality in discussion sections in master’s theses and research articles using an expanded and hence more detailed taxonomy of citation functions has shown that citations not only occur where present results are compared to results from previous studies but throughout the discussion section showing rich contextualization of the current study within previous studies. The relationship constructed between the text and previous ones is complex and multi-faceted. Reference to previous research often does not simply have the function of providing background knowledge or giving attribution to a proposition. More than that, the citation is often used to advance the author’s argument by providing an explanation for an anomalous finding or providing an interpretation of a finding. It is by referring to other texts that these authors, both student and published, are able to account for their findings, provide recommendations, evaluate their own study, and even make claims about the state of the field as a whole.

Some of the rhetorical functions served by intertextual links are a means of establishing discrete points of connection between the study reported and previous studies, such as providing explanations for research findings or bases for recommendations. In contrast, some other kinds of citation use identified here appear to establish more macro-level or higher order connections with previous disciplinary discourse. Specifically, evaluating one’s study in terms of the contributions it offers to the field as a whole and evaluating the area of study in order to specify future direction for research might be seen as requiring a broad perspective of the research arena and, not surprisingly, are more frequently found in the published texts.

It should be mentioned that the views of the specialist informants with regard to their students writing a thesis in biology also point to the importance and challenges of establishing intertextual connections in academic writing. As one of the specialist informants said, “That (the discussion section) is the hardest thing for them to write ... I think that is perhaps the hardest part, making connections between what they’ve done and what’s already been done.” When asked about difficulties that student writers have in producing a successful thesis, the second informant stated,

> I would think it is ... difficulty in focusing on the bigger issues of presenting the results. More often than not a student gets much more involved with the details of their project and loses sight of the bigger picture. So it’s trying to bring them back to the bigger picture and implications in writing the thesis. So those are some of the areas most students have trouble with.

The above statements regarding the students’ difficulty in linking their individual studies to the “bigger picture” echo the sentiments of faculty in a university in New Zealand (Bitchener & Basturkmen, 2006) and might seem to imply large differences between citation use in the student and published texts. However, my analysis does not reveal such vast differences but points to a few interesting differences in citation use across these two sets of texts. One difference is that research article writers might not just present the results from other findings as a comparison to theirs but also interpret previous findings, a rhetorical function that would require a deeper understanding of the field and more disciplinary authority from the author. A greater use of citations to evaluate the study being reported as well as the state of the field in the research article discussions points to a use of intertextual links for an evaluative function. Such evaluations of the field based on previous research seem to lead to research recommendations built on previous research. Using source texts for such a rhetorical purpose means the author has to move beyond establishing superficial links to previous academic discourse merely by comparing current results to previous results.

Student writers on the other hand, seem to use citations to explain their own findings to a larger extent than published authors. However, this rhetorical function of citations does involve the student writer going beyond performing a simple comparison of results from two studies. The differences in citation functions across these two sets of texts could be explained as stemming from the genres the two sets of texts belong to, although it is generally not the case that students have published in academic journals before completing the master’s thesis. According to one specialist informant interviewed, master’s
theses do get revised and submitted as research articles but he stated that students “don’t have a sense of” aspects of a thesis that don’t belong in a research article manuscript and detailed the changes, such as a reduction in the methodology section, that needed to be made to a master’s thesis to produce an acceptable research article manuscript. Differences in citation use could be due to both differences in writer expertise in research writing and to genre expectations. However, from these discussions with the specialists it seems that, although the research article is held up as the model for a master’s thesis, discourse features acceptable in a master’s thesis would not be acceptable in a research article.

Overall, there is a certain degree of similarity between master’s theses and research articles in the ways that they use citation – at least in terms of the functions discussed here. The student writers, on the whole, exhibit the same range of citation function as the published authors. Unlike Petric’s (2007) findings of the low-rated theses, students’ use of citations in my study did not tend toward descriptiveness. In addition, it cannot really be claimed, as Mansourizadeh and Ahmad (2011: 9) do about writing in engineering, that the students exhibited a less sophisticated and complex use of citations than published authors. This could be due to the fact that Mansourizadeh and Ahmad (2011) analyzed shorter research papers and not master’s theses, produced after a somewhat lengthy period of research. The overlap seen between citation use in theses and research articles in my study may not be found in other disciplines and needs further study.

Early analyses of research introductions (Swales, 1990) only pointed to the use of intertextual connections in one step “reviewing literature” in Move 2, but later studies (such as Samraj, 2002) indicated that previous research appears in all three moves in the introduction. Likewise, what this study foregrounds is the multiple ways in which citations are woven into discussions beyond a straightforward comparison of results. It might be argued that most of these functions overlap with the rhetorical movements found in discussion sections but that in itself is a useful finding. The functions of citations identified in previous studies, such as Mansourizadeh and Ahmad (2011), also stem from rhetorical moves in research articles such as comparison of one’s own findings with other sources. However, this is not consistently the case and their taxonomy also includes functions such as “identification,” where a citation is said to identify the agent of the cited sentence. This sort of citation function has to do with how a cited text or author is focused on and does not have much to do with the discourse function of the citation. In contrast, a taxonomy, like the one presented here, that is related to the rhetorical progression of a genre or part-genre may be more useful for showing novices the various ways in which previous research is used in the construction of a genre, although the taxonomy might not be easily generalized. A close contextualized analysis of citation use rather than one that labels citations as “source” or “attribution” might be less tidy an analysis but could reveal more of the complexity of building on previous research and hence lead to more successful teaching of academic writing.

5. Pedagogical implications

EAP researchers have noted that ESL students need instruction on the construction of intertextual links in their academic writing. In addition, a number of studies on graduate students’ academic writing have also noted the challenges posed by source text use in advanced academic writing, while also noting how instrumental they are to the creation of appropriate authorial stances (Abasi et al., 2006; Dong, 1996). The results of this study show the complex web that intertextual links form in the construction of discussions of results and can be directly applied to academic writing instruction. A taxonomy, such as the one I have presented, could be used to make graduate students and junior scholars more rhetorically aware of the role that citations play not just in the introductions and literature reviews in their theses but also in the discussion sections. Students need to be made aware that intertextual links can perform more than one role in discussion sections. Explicitly labeling and describing these roles will surely make novice academic writers aware of the many ways in which the papers that they so painstakingly read in preparing to conduct their thesis research and the readings they perform throughout the thesis research stage can be incorporated into their own writing.

The results of this study can be easily turned into pedagogical materials for the L2 composition classroom and even for less experienced English L1 writers for research purposes. EAP instructors can select excerpts (one or more pages) from published texts or from master’s and Ph.D. theses that illustrate some of the rhetorical functions which citations serve. After pointing out one or two of these functions, teachers could have their students inductively figure out either individually or in small groups the functions served by other citations in those texts, which have been identified by the instructor. As indicated earlier, the rhetorical functions identified in this study may only be found in texts that discuss results from empirically based studies. As such, the EAP instructor could have students analyze published texts or those written by advanced students in their own discipline to determine the match between the functions identified in the controlled exercise and those found in their own disciplinary texts. Such an exercise would cause students to extend the taxonomy to capture the citational use in their own disciplinary areas. Such instruction will take students beyond the difference between integral and non-integral citations and the selection of tense and reporting verb when they construct intertextual links, which could complement a focus on rhetorical functions.

References


\* Not much information is provided about the context in which these papers were produced.


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