A Contrastive Study of Determiner Usage in EST Research Articles

Peter Master

INTRODUCTION

The research article is the primary means of disseminating new scientific knowledge in the English language. As such, it constitutes a genre whose form and conventions are of considerable interest not only to English scientific writers but also to those who do not speak English as a native language but who wish to participate in the dissemination of knowledge and thus gain access to and the respect of the world scientific community. Although the percentage of research articles published in English may be somewhat exaggerated (Swales 1990:97-99), English still overwhelmingly predominates, accounting for 45 to 75 percent of all research articles in the world. The fields of science and technology are probably the most relevant as they are (or are perceived to be) the means to becoming competitive on the world market. It is for these reasons that research articles in science and technology in English are considered to be of primary importance.

Swales (1990) summarizes the many studies have been done on various aspects of the research article. At the discourse level, these include paragraph development (Lackstrom et al. 1973 and Weissberg,1984). At the sentence level, these include definitions (Darian 1982), authorial comment (Adams Smith, 1984), citation patterns (Jacoby 1987), and topic sentences (Popken , 1987). At the grammatical level, these include descriptions of tense (Lackstrom et al.,1972; Ard,1982; Heslot, 1982; Een, 1982; and Malcolm, 1987), aspect (Ard, 1982), voice (Tarone et al., 1981;Tomlin, 1981; and Wingard ,1981), modals (Lackstrom, 1978 and Ewer, 1979),*that*-nominals (West, 1980), and personal pronouns (Ard, 1983).

One grammatical area that is universally acknowledged to be of great difficulty for nonnative speakers of English is the determiners, particularly those that constitute the article system. As the determiners have not yet been focused upon in the literature devoted to describing the research article, it is the purpose of the present study to analyze their use in this genre. This analysis will be concerned with sixteen research articles in eight fields concerned with science and

technology: biology, chemistry, clinical psychology, computer science, geology, mechanical engineering, medicine, and physics.

Determiners

The term determiner is used to describe the grammatical element that comes at the beginning of a noun phrase. A determiner is an obligatory element of a noun phrase, the only other obligatory member of which is the noun itself. Since noun phrases, not nouns, are one of the constituents of a sentence, it follows that a noun cannot appear by itself in an English sentence: it must minimally be preceded by a determiner. Since every noun requires a determiner, it is not surprising that determiners constitute some of the most frequent words in the language. In the cobuild frequency count (Sinclair 1990:143), the most frequent form in the language is the fifth most frequent is a, and the top 100 forms include twelve central determiners.

The determiners in English constitute a relatively new class of grammatical items in the history of English linguistics. *Determiner* as a grammatical category is not defined at all in Webster's New Collegiate Dictionary (1960) and the words that constitute determiners are still referred to as adjectives in many modern dictionaries (e.g., Random House, 1989). The justification for the new category is made clear in Klegr (1987):

> When the noun has become so restricted morphologically as in English, it seems natural to turn to the existing specialized items at hand to provide the necessary signals for it. This new and important function of deictics and quantifiers has been recognized by distinguishing a new class of grammatical items: determiners" (p. 32)

The function of determiners in general is to "pick out a certain element or certain elements from a certain set.. of entities over which the hearer intends to quantify" (Platteau 1980:114) or to "modify the scope of the set designated by the noun that follows" (Stephanides 1978:79), i.e., to "restrict or widen, to specify or generalize the meaning of the modified noun" (p. 84). Barrie (1971) describes the determiners as "aspectual and/or modal particles [that give] a particular colouring to the nouns they introduce, in much the same way as the different forms or auxiliaries

of the English verb serve to convey aspectual or modal information, and enjoying a semi-autonomous existence, in the sense that they sometimes modify strongly the value of the noun they preface and sometimes merely reinforce it in a way that is possibly redundant" (p. 331). Klegr (1987) concludes that "the function of determiners appears to be to provide grammatical status combined with specific semantic reference" (p. 31).

Because of co-occurrence restrictions, the determiners are divided into three separate groups: predeterminers, central determiners, and postdeterminers (Leech and Svartvik, 1975), although "whether the pre- and postdeterminers are to be seen as an integral part (subsets) of the determiner class or as a separate, transitional class between determiners and modifiers (L. Duskova, 1985)...is still far from clear" (Klegr, 1987:29). The three groups are shown in Table 1.

[Table 1 about here]

The central determiners[1] are the most important of the three, primarily because they include the articles, and will be the focus of the present study. Their formal features are that 1) they constitute a separate element within the noun phrase (Duskova, 1985), 2) they are an obligatory element in noun phrases, 3) they are mutually exclusive (i.e., there can only be one at a time), 4) they occupy the initial position within the premodification structure (determiner-modifier-head noun), and 5) they form a closed system of items (Klegr 1978:29-30).

The predeterminers and postdeterminers, on the other hand, are not obligatory and are not mutually exclusive with the articles. There are some co-occurrence restrictions, usually based on quantification (e.g.,*all some people), but several subgroups may combine (e.g., the other two candidates). Furthermore, these determiners do not form a universally-accepted closed class (e.g., if both is a predeterminer, why not two of; if many is a postdeterminer, why not numerous?). It is the amorphousness of these latter categories that led to their exclusion from the present study. Furthermore, Kennedy (1980) has dealt with quantifiers, to which the postdeterminers clearly belong, at length elsewhere.

The Present Study

The aim of the present study is to provide a picture of determiner use in research articles within the domain of science and technology. This will be done by determining the frequency of occurrence of the central determiners shown in Table 1 and the frequency with which the same word plays other syntactic roles besides determiner in this context. For example, the word that has four possible roles:

Determiner	I want that garbage removed.
Pronoun	He wants that removed.
Relative Pronoun	The garbage that they left should be removed.
Complementizer	I assume that the garbage will be removed.

The aim of the present study is to add to the existing knowledge base concerning the role and frequency of occurrence of certain grammatical structures in the genre of research articles. The delineation of a genre has as its ultimate goal the means whereby to show others, particularly but by no means exclusively nonnative speakers of English, how to communicate within the conventions of that genre and thereby gain access to the discourse community to which it belongs. The underlying pedagogical intent of this process is made clear in Swales (1990):

> If we are going to defend [the higher] ground [of advanced English], one of the things we need to do is examine the terrain with as much care and continuing attention as our talents and resources permit. In our present partial and fragmented state of knowledge, teaching research English requires its own research agenda. (p. 232)

METHOD

Research articles representing eight fields within the domain of science and technology were selected from recent issues of respected journals, two articles in each field. Two research articles from TESOL, a field outside the realm of science and technology, were also selected for comparison. The fields, titles, authors and source of each research article are shown in Table 2.

[Table 2 about here]

Each research article was scanned and entered into a word-processing program to facilitate the analysis. The text analyzed included the title, the abstract, the body of the text, and any acknowledgements. It did not include tables, figures, formulas and equations outside the running text, or the references section. Proper names were also excluded. The central determiners were identified and counted in each article and then entered into a graphing program to provide figures from which the results were drawn. The total word count per article was determined by means of a computer word-count utility to guarantee accuracy and uniformity.

Certain methodological problems arose in the process of counting the zero articles, the greatest of which was what to do with mathematical symbols and formulas. Since symbols and formulas were occasionally referred to with definite articles, it was determined that the remaining cases must be counted as utilizing the Ø article. Furthermore, since the zero articles make up a percentage of determiner use yet are not visible to the word-counting program, the total number of zero articles was added to the total word count for each article before the percentages of occurrence were calculated.

Since related research (Master 1991)[2] suggested that the life sciences may differ in certain respects from the physical sciences, the data were analyzed not only in terms of the whole corpus but also with the life and physical sciences treated separately.

RESULTS

The results of the determiner analysis are presented in terms of overall determiner use, in terms of the articles, and in terms of the remaining determiners. The frequency of each determiner category is further reported as a percentage of total words to allow comparison with the frequencies reported for certain determiners in Goodman (1987).

Overall Determiner Usage

The number of determiners in relation to the length of each research article in number of

words is shown in Figure 1. Figure 1 shows that the overall determiner use is remarkably

[Figure 1 about here]

consistent across the EST disciplines. The average percentage of determiners per number of words was 18.3, slightly higher for the physical sciences (18.7), slightly lower for the life sciences (17.7).

The Articles

The articles a(n), the, and Ø accounted for the majority of determiners by a very large margin, as shown in Figure 2. The average for the EST corpus is 90.3%. The figures are

[Figure 2 about here]

slightly lower for the physical sciences (89.7%) and slightly higher for the life sciences (91.4%) but for all intents and purposes they are the same.

The distribution of the articles in the EST corpus is shown in Figure 3. Of the articles,

[Figure 3 about here]

the most frequently occurring is the zero article Ø (51.2%), followed by the (37.8%) and a (11.0 %). The zero article appears to be least prevalent in the mechanical engineering RAs, most prevalent in the biology RAs. In fact, the five physical science fields showed an average zero article percentage of 44.1%, whereas the three life sciences yielded an average of 62.9%. This is a substantial difference considering the fact that the percentage of determiners comprising articles was almost identical in the physical and life sciences. One explanation of the higher occurrence of zero articles in the life sciences might be found in Jespersen's (1949) claim that that which is most familiar requires no article (e.g., home vs. the house), i.e., that the life sciences deal with "more familiar" subjects than do the physical sciences.

The article the is the second most frequently occurring article. It mirrors the occurrence of the zero article, appearing less often in the life sciences (29.5%) and more often in the physical sciences (42.8%).

The article a(n) plays a decidedly lesser role and a less predictable one as far as type of RA is concerned. It ranges from a low of 4.9% in the biology RAs to a high of 14.8% in the computer

science RAs. Overall, the life sciences showed an average *a* use of 7.6%, the physical sciences 13.0%; however, it can be seen from Fig. 3 that *a* is not consistently high in the physical sciences. Since *a* only occurs with singular countable nouns in English, it is not surprising that it should appear less often. However, since the choice of *a* versus zero depends on the lexical feature of countability, it is the nature of the lexical item rather than any syntactic consideration that determines its use. Indeed, Poldauf (1967:15) says that "the indefinite article might be more aptly called 'the mark of countability.'" The word another was included in this category, consisting as it does of the article an adjoined to the postdeterminer other. It had to be coded in the textual analysis so as to exclude non-determiner uses such as one another. There were only eleven instances of another as a determiner (out of fourteen occurrences) and nine of these (81.8%) were in the physical science RAs.

Researchers concerned with frequency counts (e.g., Goodman 1987:33, Sinclair 1990:143) agree that the is the most frequent word in the English language. The present study suggests that the may be the most frequent word, but the zero article is the most frequent free morpheme. The neglect of the zero article in much determiner research has been noted before (e.g., Master 1987:7) "probably because it has neither phonologic (sic), nor graphemic overt form" (Stephanides 1978:84). It is, of course, impossible for a computer to tell when a zero article has been used; furthermore, until it is able to discern phrase structure, concordancing software will be limited to the production of overt frequency counts with no indication, short of interpreting from the immediate linguistic environment, what the syntactic function may be. For this reason, in the present study all occurrences of the zero article had to be coded before they could be tallied. The same was done with the determiners that play other syntactic roles (e.g., that, his, and which).

The Other Determiners

The other determiners include the demonstratives, the possessives, the quantifiers, and the interrogatives. Together they account for just under 10% of the total determiner count.

The Demonstrative Determiners: this, these, that, and those

The demonstrative determiners, which include the words this and that and their corresponding plural forms these and those, together account for 4.5% of the determiners in the EST corpus. Nevertheless, the demonstratives account for the second largest group of determiners after the articles, reaffirming the predominance of the latter. Figure 4 shows the distribution of

[Figure 4 about here]

the four demonstrative determiners in the EST corpus. The physical sciences show a slightly greater tendency to use these determiners (5.2%), the life sciences a slightly lesser tendency (3.2%). Of the 1140 occurrences of the four words in the sixteen RAs, 52.1% were determiner uses.

This and These.

The word this functions either as a demonstrative determiner or as a pronoun in English. In the EST corpus, it functioned as a determiner 79.9% of the time. This figure was considerably lower in the life sciences (66.0%) than in the physical sciences (84.2%).

The plural form these also functions as a demonstrative determiner or as a pronoun. It occurred just over half (239/423) as frequently as this, but it was much more likely to function as a determiner (94.6%) than a pronoun in both the life (92.3%) and the physical (95.4%) sciences.

That and Those

The word that, as described earlier, has four different functions in English: demonstrative determiner, pronoun, relative pronoun, and complementizer. In the EST corpus, it functioned as a determiner 4.0% of the time, slightly lower in the life sciences (3.0%), slightly higher in the physical sciences (4.3%). It is far more likely to function as a relative pronoun or a complementizer. In fact, in half (8/16) of the research articles analyzed, there was not a single instance of that as a determiner.

The plural form those, like this and these, is restricted to the functions of demonstrative determiner or pronoun. It occurred relatively infrequently, with less than an eighth (52/426) of

the frequency of that. It functioned as a determiner 25.0% of the time, much less so in the life sciences (13.0%) and much more in the physical sciences (34.5%).

Possessive Structures: my, our, your, his, her, its, their, and -'s

The possessive structures include the possessive determiners and any noun phrases to which the possessive 's (plural s') morpheme has been attached. Together they account for only 2.4% of determiner use in the EST corpus, the physical sciences showing a slight preference for the genitive 's (1.0 vs. 0.8%), the life sciences a slight preference for the possessive determiners (1.8 vs. 1.3%). Figure 5 shows the distribution of the two possessive forms in the EST corpus.

[Figure 5 about here]

Possessive Determiners

The possessive determiners include the words listed in Table 3, shown with their

[Table 3 about here]

corresponding frequencies of occurrence in the EST corpus. Table 3 shows that their was the most frequently occurring possessive determiner, followed by its and our. Our was equally represented in the life and the physical sciences, but its occurred as a far greater percentage (49.1%) of the physical science possessive determiners than of those in the life sciences (15.6%). Perhaps it occurs with more frequency in the physical sciences because they are more concerned with things than people.

Their accounted for 61.0% of this category of determiners in the life sciences compared to 37.0% in the physical sciences. That their shows the highest frequency of the possessive determiners is not surprising since it refers to both singular and plural noun phrases. The more frequent occurrence in the life sciences is perhaps explained by the fact that patients were frequently referred to in the plural in four of the six life science RAs (medicine and clinical psychology).

Overall, the possessive determiners accounted for a relatively insignificant 1.5% of total determiner use. This was slightly higher in the life sciences (1.8%), slightly lower in the physical sciences (1.3%).

Possessive 's

Possessive 's (plural s') transforms an entire noun phrase into a central determiner. Possessive noun phrases account for a small fraction (0.9%) of determiner use in the EST RAs. This fraction was slightly higher in the physical sciences (1.0%), slightly lower in the life sciences (0.8%), with the highest single percentage occurring in one of the computer science RAs (4.3%), the second highest in one of the mechanical engineering RAs (2.9%) This mitigates somewhat against the notion that 's occurs predominantly with animate noun phrases (e.g., Frank 1972:14), which would have led one to expect a higher proportion of genitive structures in the life sciences.

There is some disagreement in the literature as to whether or not possessive 's actually belongs to the class determiner. Suzuki (1988) argues that "the genitive morpheme is a bound morpheme attached to a DP (determiner phrase) appearing in genitive case position, whereas determiners are the head of Determiner Phrase" (p. 91). However, although they do not include the genitive morpheme in their list of determiners, Greenbaum et al. (1990) state, "For the most part, genitives function exactly like central definite determiners and thus preclude the cooccurrence of other determiners" (p. 105).

The Assertive-Nonassertive Determiners: some and any

The words some and any, like the demonstrative, interrogative, and certain possessive determiners, have the dual function of determiner and pronoun. The assertive-nonassertive determiners some and any together accounted for 0.9% of the total determiners in the corpus, slightly more frequently in the physical sciences (1.1%), less so in the life sciences (0.7%). Their distribution in the EST corpus is shown in Figure 6.

[Figure 6 about here]

Some

As a determiner, some has two possible forms. In the unstressed form (sometimes indicated as s'm), it indicates an indeterminate amount or "partitive indefinite" (Greenbaum et al. 1990:124), e.g., He drank some water. In the stressed form, it means "one unidentified, a

certain" (Greenbaum et al. 1990:74) or the equivalent plural "certain unidentified", e.g., Some people like it; others don't. In the EST corpus, the use of some was exclusively the stressed form. This is probably because of the rather imprecise nature of the partitive indefinite and its relative informality. Some functioned primarily as a determiner (93.3%). In the life sciences, this was exclusively the case (18/18); in the physical sciences, 91.2% (52/57) of the cases showed the determiner function. In this function, some accounted for 0.11% of the total words. Goodman's (1987) analysis of determiners in children's stories (which analyzed a corpus of similar size) found some to account for 0.21% of the total words, almost double the frequency in the EST corpus.

Many researchers (e.g., Quirk et al. 1972, McEldowney 1977, Celce-Murcia and Larsen-Freeman 1983, Goodman 1987) consider unstressed some to be a member of the article family as it frequently takes the place of the zero article, e.g., There are some letters on the table *vs.* There are (Ø) letters on the table. This practice has not been adhered to in the present study because of the comparative informality of unstressed some and because of the methodological decision to consider (following Greenbaum et al. 1990:74) the assertive-nonassertive determiners as a natural pair.

Any

Although any can function as a pronoun, it never did so in the EST corpus. It functioned as the general nonassertive determiner in every (62/62) instance. As a percentage of total words, any accounted for 0.09%. Goodman's (1987) analysis also found any to account for 0.09% of the total words.

The Negative Determiner: no

The word no has three possible functions in English: as the negative determiner; as an adverb with comparative adjectives and adverbs, e.g., no larger than, no longer, no less important than; and as a sentential adverb, e.g., No, I want coffee. No occurred as a determiner in 96.1% (98/102) of the cases. It occurred as a determiner in the life sciences (95.7%) at about the same percentage as in the physical sciences (96.4%). The distribution of no in the EST corpus is shown in Figure 7. As a percentage of total words, no accounted for 0.16%. Goodman's (1987)

[Figure 7 about here]

analysis found no to account for 0.07% of the total words in children's stories, less than half the percentage found in the EST corpus. However, the figure is higher in the life sciences (0.20%) and lower in the physical (0.12%).

The Universal, Nonassertive Dual, and Negative Dual Determiners: each, every, either, and neither

The words each, every, either and neither were tallied together as there were so few in the corpus. They accounted for 1.00% of the total, slightly higher in the life sciences (1.15%), slightly lower in the physical (0.91%). Every has a single function as a determiner. Each, either and neither have several functions. The distribution of these four determiners as a group is shown in Figure 8.

[Figure 8 about here]

Each

The word each, like several other central determiners, has the dual function of universal determiner and pronoun. In the EST corpus, it plays the role of determiner 84.87% of the time, slightly less in the life sciences (80.49%), slightly more in the physical sciences (87.18%). As a percentage of total words, each accounts for 0.15%. Goodman's (1987) analysis found each to account for 0.10% of the total words in children's stories, two-thirds of the percentage found in the EST corpus.

Every

Every can only function as a determiner. As a percentage of total words, the universal determiner every accounts for a mere 0.027%, 0.018% in the life sciences and 0.032% in the physical sciences. Goodman's (1987) analysis found every to account for 0.030% of the total words in children's stories, which is very close to the number in the EST corpus.

Either

Either can function as a determiner, as a pronoun, or as a coordinating conjunction with or. In the EST corpus, it functions as a nonassertive dual determiner 21.21% of the time, slightly

higher in the physical sciences (22.22%), slightly lower in the life sciences (20.00%) but for all intents and purposes the same. As a percentage of total words, either accounts for 0.01% of the total, seven instances in 65,729 words. Goodman did not count this determiner in his study and no other studies have been found with which to compare this figure. Needless to say, it does not appear in Sinclair's (1990) list of the 100 most frequent words in English although several other determiners do.

Neither

Neither, the negative counterpart of either, functions as a determiner, a pronoun, or as a coordinating conjunction with nor. As a determiner, it plays an even lesser role than either. The negative dual determiner either occurred only eight times in the EST corpus and only one of these was as a determiner, accounting for 12.50% of the total. This single instance occurred in the life sciences; none occurred in the physical. As a percentage of total words, the determiner neither accounts for 0.0015%.

The Wh-determiners: which, what, and whose

The *wh* -determiners which, what, and whose together account for 0.14% of the total determiners. This low figure is not surprising because the *wh* -determiners occur chiefly in questions, and questions occur rarely in research articles. The distribution of these three determiners as a group in the EST corpus is shown in Figure 9.

[Figure 9 about here]

Which

Which can function as a relative pronoun, as an interrogative pronoun, or as an interrogative determiner. In the EST corpus, it functions as a determiner 2.73% of the time (6/220 instances), more in the life sciences (5.09%), less in the physical sciences (1.86%). As a percentage of total words, the determiner which accounts for 0.009%.

Whose

Whose can function as an interrogative pronoun or as an interrogative determiner. In the EST corpus, it functions as a determiner 100% of the time. This is to be expected, however, as

whose can only function as a pronoun (e.g., Whose is this?) when the referent is clear and present, a situation that occurs in informal conversation but never in academic discourse. As a percentage of total words, the determiner whose accounts for 0.008%.

What

What can function as an interrogative pronoun, as an adverb, and as an interrogative determiner. It functions as a determiner 36.36% of the time, exclusively so in the life sciences (2/2 or 100%), much less so in the physical sciences (2/9 or 22.22%). As a percentage of total words, the determiner what accounts for 0.006%.

DISCUSSION

The most interesting result of the determiner analysis is the finding that the scientific research RAs studied are remarkably similar as far as the percentage of determiners comprising articles is concerned (90.3%). Since one of the purposes of this study is to begin to "examine the terrain" of this genre, it is useful to compare these results with those from other genres, as shown in Figure 10. Figure 10 shows that the science RAs have the highest percentage of articles

[Figure 10 about here]

vs. other determiners. Four issues of Science News, a weekly magazine which represents typical "midbrow" scientific discourse (Master 1991), shows that 89.1% of its determiners were articles. 88.6% of the determiners in the non-EST RAs were articles. 82.6% of the determiners in a single issue of Newsweek were articles. In a novel by Graham Greene (1985) entitled The Tenth Man, 77.7% of the determiners were articles. Finally, two Shakespearean plays, Macbeth and Julius Caesar, showed that an average of 59.0% of the determiners were articles (excluding all forms of direct address).

The similarity of the figure for the non-EST research articles to that in the EST corpus begins to suggest that the RA as a genre can be categorized as having a high, possibly the highest, percentage of articles per total number of determiners even though the percentage of determiners per total words is relatively constant across genres. Sophisticated journalistic prose is fairly

similar in this regard. Literary fiction shows a comparatively lower figure, which is largely due to the much higher proportion of possessive structures.

Comparison of Determiner Usage in EST and Non-EST RAs

Article use in the non-EST RA is compared to RAs in the eight EST fields in Figure 11.

[Figure 11 about here]

Figure 11 shows that the non-EST RA fits squarely among the EST RAs, suggesting that the nature of the RA is less significant than the genre itself as far as article use is concerned. This is further confirmed in Figure 12, which compares the other (i.e., non-article) central

[Figure 12 about here]

determiners in the two groups. The difference in the 's/Dets category can be explained by the fact that the non-EST articles concerned research with ESL students, and thus there was frequent need for the possessive 's structure (e.g., "students' preferences").

Comparison of Article Use in Life and Physical Science RAs

A comparison of article use in the life and physical sciences may show that within the genre of EST RAs there are certain identifiable subcategories (e.g., life and physical sciences). The differences found between the physical and life science RAs are summarized in Figure 13.

[Figure 13 about here]

Figure 13 shows that the percentage of total determiners comprising indefinite a(n) is much higher (nearly double) in the physical sciences, whereas the use of the indefinite zero determiner is a third lower. The use of the definite article the is also somewhat higher in the physical sciences. Similarly, the use of demonstrative determiners is considerably higher in the physical sciences.

Using the binary categories of classification (indefinite a and Ø, some/any, and no) vs. identification (definite the, possessive structures, demonstrative determiners, each/every/either/neither and WH-determiners) described in Master (1990), the physical sciences classify (53%) slightly more than they identify (47%). On the other hand, life sciences classify (66%) much more than they identify (34%). Although this is probably a consequence of the actual topic

of the RA, it is an interesting distinction.

The non-EST RAs classify more (59.5%) than they identify (40.5%) and in this regard, as in certain others, they appear to be midway between the physical science RAs and the life science RAs. In Newsweek, on the other hand, the determiners classify 64% and identify 36%, suggesting that the life science RAs are closer in nature to general journalistic prose than the RAs in the physical sciences (this observation is also borne out by casual assessment) whereas the physical science RAs comprise a more unique group in their use of articles.

Comparison of EST and Non-EST RAs to Goodman's Analysis of Children's Stories

The frequency of occurrence of the determiners some, any, each, every, and no in Goodman's (1987) analysis of children's stories has already been provided under the relevant determiner category in the previous section. These frequencies[3], along with those for the non-EST RAs, are summarized in Figure 14. Figure 14 shows that only the determiner each occurs at

[Figure 14 about here]

a frequency that is identical in all three samples. Every shows similar frequencies in the EST RAs, but the non-EST RA figure is somewhat lower.

The frequency of the determiner any is the same in the averaged EST RAs as it is in the children's stories. The frequency of the determiner some is almost twice as high in the children's stories as it is in the three RA categories, which show quite similar figures. The frequency of the determiner no is also almost twice as high in the EST RAs as it is in the children's stories.

In sum, the frequency per total words of the determiners every and any seem to be fairly constant no matter what the genre, suggesting that this frequency may hold across genres and be a feature of the larger category of written prose. The frequencies of the determiners some, each and no are somewhat different in the two genres, the higher frequency of some in the children's stories perhaps arising from the use of the unstressed form (s'm), which never occurred in the RAs.

CONCLUSION

The analysis of determiner use in EST research articles has shown that the frequency

and/or percentage of occurrence of certain members of this syntactic group may serve to characterize the genre. The best candidate for such a characterization appears to be the percentage of total determiners that comprise the article system. As far as determiner use is concerned, the research article as a genre appears to maintain its boundaries no matter what the topic while it differs in specific ways from fictional prose.

Further research on this and other syntactic elements in the research article genre and other written genres is needed in order to continue to characterize the genre at all levels. In this way, our "partial and fragmented state of knowledge" (Swales 1990, p. 232) may begin to take a form that will be of the greatest use to both students and teachers of research English.

ENDNOTES

1. Although Quirk et al. (1972) include the words much and enough in their list of central determiners, they have been excluded here, much because of its semantic similarity to the postdeterminers many and little, and its apparent function as a predeterminer in a noun phrase such as much the better athlete, enough because of its semantic similarity to the adjective sufficient and the fact that it can function as both a pre- and a postmodifier, thereby casting doubt on their true functions.

2. Master (1991) analyzes the occurrence of active verbs with inactive subjects in a corpus of nearly 3000 subject-verb pairs taken from ten annual "Science News of the Year" columns in the weekly magazine Science News. It was found in this study that the physical sciences used inanimate subjects with active verbs comparatively more frequently than did the life sciences. This finding was not reported, however, because it requires confirmation from an analysis of full- fledged scientific research articles. Nevertheless, because the distinction is a potentially interesting one, the analysis in the present study also analyzes the data from this perspective.

3. The data from Goodman (1987) are assembled from figures provided in his article. He reports the number of instances of the determiners indicated and provides the total wordcount (63,176) in the corpus of children's stories but does not directly report percentages per total words.

REFERENCES

Adams Smith, D.E. (1984). Medical discourse: aspects of author's comment. The ESP Journal 3:25-36.

Alexander, P. (Ed.) (1958). The heritage Shakespeare. New York: The Heritage Press.

Ard, J. (1982). The semantics of tense and aspect in scientific discourse. Paper given at the Ohio State University Conference on the Semantics of Tense and Aspect, May, 1982.

Ard, J. (1983). The role of the author in scientific discourse. Paper given at the annual American Applied Linguistics Meeting, Minneapolis, MN, December, 1983.

Barrie, William B. 1971. What's in a determiner? Languages Modernes 65(4):69-80.

Celce-Murcia, M. & Larsen-Freeman, D. (1983). The grammar book. Rowley, MA: Newbury House.

Darian, S. (1982). The role of definitions in scientific and technical writing: forms, functions and properties. In Hoedt, et al. (Eds.). Pragmatics and LSP. Copenhagen: Copenhagen School of Economics.

Duskova, L. (1985). The role of definiteness in functional sentence perspective. In Hlavsa, Z. & Viehweger, D. (Eds.) Aspects of text organization, 57-74, Linguistica XI, Ustav pro jazyk cesky CSAV, Prague.

Een, J. A. (1982). Tense usage in reporting research in geotechnical writing. In Working Papers in ESL (2):72-91. Minneapolis: University of Minnesota.

Ewer, J.R. ((1979). The modals in formal scientific discourse: function, meaning and use. Santiago, Chile: Research Report, Department of English.

Flexner, S.B. (1987). The Random House dictionary of the English language. New York: Random House.

Frank, M. (1972). Modern English: a practical reference guide. Englewood Cliffs, NJ: Prentice-Hall.

Greene, G. (1985). The tenth man. New York: Pocket Books.

Greenbaum, S. & Quirk, R. (1990). A student's grammar of the English language. London: Longman.

Goodman, Kenneth S. (1987). Determiners in reading: miscues on a few little words. Language and Education 1(1):33-57.

Heslot, J. (1982). Tense and other indexical markers in the typology of scientific texts in English. In Hoedt, et al. (Eds.). Pragmatics and LSP. Copenhagen: Copenhagen School of Economics.

Jacoby, S. (1986). The inevitable forked tongue: an analysis of references to other researchers in literary research articles. Unpublished MA thesis, The University of Birmingham, UK.

Jespersen, O. (1949). A modern English grammar on historical principles. Part VII: Syntax. Completed and edited by N. Haislund. London: George Allen and Unwin; Copenhagen: Munksgaard.

Kennedy, G. D. (1980). Quantification and the use of English: a case study of one aspect of the learner's task. Applied Linguistics 8(3):264-86.

Klegr, A. (1987). Whole and determiners. Philologica Pragensia 30(1):27-35.

Lackstrom, J. (1973). Technical rhetorical principles and grammatical choice. TESOL Quarterly 7:127-36.

Lackstrom, J. (1978). Teaching modals in EST discourse. In Trimble, Trimble and Drobnic (Eds.). English for specific purposes: science and technology. Corvallis: Oregon State University.

Lackstrom, J., Selinker, L., & Trimble, L. (1972). Grammar and technical English. English Teaching Forum X(5):3-14.

Leech, G. & Svartvik, J. (1975). A communicative grammar of English. London: Longman.

Malcolm, L. (1987). What rules govern tense usage in scientific articles? English for Specific Purposes 6:31-44.

Master, P. (1987). A cross-linguistic interlanguage analysis of the acquisition of the English article system. Unpublished doctoral dissertation, UCLA.

Master, P. (1990). Teaching the English articles as a binary system. TESOL Quarterly 24(2): 461-478.

Master, P. (1991). Active verbs with inanimate subjects in scientific prose. English for Specific Purposes 10(1); 15-33.

McEldowney, P.L. (1977). A teaching grammar of the English article system. IRAL 15(2):95-112.

Merriam-Webster, A. (1960). Webster's new collegiate dictionary. Springfield, MA: G. & C. Merriam Co.

Newsweek 63(2), January 9, 1989.

Platteau, Frank. (1980). Definite and indefinite generics. In Van der Auwera (Ed.), The Semantics of Determiners. Baltimore, MD: University Park Press.

Poldauf, I. (1967). On lexical limitations to grammatical properties. Acta Universitatis Carolinae, Philologica 5, Prague Studies in English XII.

Popken, R.L. (1987). A study of topic sentence use in academic writing. Written Communication 4:209-28.

Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1972). A grammar of contemporary English. London: Longman.

Sinclair, J. (1991). Corpus, concordance, collocation. Oxford: Oxford University Press.

Stephanides, Eva H. (1978). The use of the article in English and Hungarian: a contrastive analysis. Papers and studies in Contrastive Linguistics 8. Poznan: Adam Mickiewicz University.

Suzuki, Tatsuya. (1988). The structure of English gerunds. Unpublished doctoral dissertation. University of Washington.

Swales, J.M. (1990). Genre analysis. Cambridge: Cambridge University Press.

Tarone, E., Dwyer, S., Gillette, S. & Icke, V. (1981). On the use of passive in two astrophysics journal papers. The ESP Journal 1:123-40.

Tomlin, R.S. (1981). Clause-level syntax and information types in EST discourse (mimeo).

Weissberg, R. (1984). Given and new: paragraph development models for scientific English. TESOL Quarterly 18:485-500.

West, G.K. (1980). That-nominal constructions in traditional rhetorical divisions of scientific research papers. TESOL Quarterly 14:483-9.

Wingard, P. (1981). Some verb forms and functions in six medical texts. In Selinker, Tarone and Hanzeli (Eds.) English for academic and technical purposes: studies in honor of Louis Trimble. Rowley, MA: Newbury House.

RESEARCH REPORTS ANALYZED

Biology

Gahukar, R.T. (1990). Sampling techniques, spatial distribution and cultural control of millet spike worm, *Raghuva albipunctella* (Noctuidae: Lepidoptera). Annals of applied biology 117 (1):45-50.

Hume, D.E. (1991). Effect of cutting on production and tillering in prairie grass (Bromus willdenowii Kunth) compared with two ryegrass (Lolium) species. 2. reproductive plants. Annals of botany 68 (1): 1-11.

Chemistry

Hall, H.K. Jr., & Padias, A. B. (1990). Zwitterion and diradical tetramethylenes as initiators of "charge-transfer" polymerizations. Accounts of chemical research 23 (1): 3-9.

Miller, R.E. (1990). Vibrationally induced dynamics in hydrogen-bonded complexes. Accounts of chemical research 23 (1): 10-16.

Clinical Psychology

Bennett, P. & Carroll, D. (1990). Stress management approaches to the prevention of coronary heart disease. British journal of clinical psychology 29(1):??-??.

Jack, R. L. & Williams, J. M. (1991). The role of attributions in self-poisoning. British journal of clinical psychology 30(1):25-35.

Computer Science

Pease, D., Ghafoor, A., Ahmad, I., Andrews, D.L., Foudil-Bey, K., Karpinski, T.E., Mikki, M.A., & Zerrouki, M. (1991). PAWS: A performance evaluationtool for parallel computing systems. Computer (IEEE) 24(1):18-30.

Stunkel, C.B., Janssens, B., & Fuchs, W.K. (1991). Address tracing for parallel machines. Computer (IEEE) 24(1):31-38.

Engineering (Mechanical)

Angeles, J. & Ma, O. (1991). Performance evaluation of four-bar linkages for rigid-body guidance based on generalized coupler curves. Journal of mechanical design 113(1):17-24.

Olsen, D.G., Erdman, A.G., and Riley, D.R. (1991). Topical analysis of single-degree-of-freedom planetary gear trains. Journal of mechanical design 113(1):10-16.

Geology (Engineering)

Collins, T.K. (1990). New faulting and the attenuation of fault displacement. Bulletin of engineering geologists 27(1):11-22.

El-Hussain, I.W., & Carpenter, P.J. (1990). Reservoir induced seismicity near Heron and El Vado Reservoirs, Northern New Mexico. Bulletin of engineering geologists 27(1):51-59.

Medicine

Hansotia, P. and Broste, S.K. (1991) The effect of epilepsy or diabetes mellitus on the risk of automobile accidents. The New England journal of medicine 324(1):22-26.

Polten, A., Fluharty, A.L., Fluharty, C.B., Kappler, J., von Figura, K., & Gieselmann, V. (1991). Molecular basis of different forms of metachromatic leukodystrophy. The New England journal of medicine 324(1):18-22.

Physics

Ponce de Leon, J. (1990). Model-independent description of intermediate-range forces in static spherical bodies. Canadian journal of physics 68(7,8):574-578.

Dickson, R.S. & Weil, J.A. (1990). The magnetic properties of the oxygen-hole aluminum centres in crystalline SiO_2.IV.$[AlO_4/Na]^+$. Canadian journal of physics 68(7,8):630-642.

Non-EST

Chapelle, C. (1990). The discourse of computer-assisted language learning: toward a context for descriptive research. TESOL Quarterly 24(2):199-225.

Carson, J.E., Carrell, P.L., Silberstein, S., Kroll, B., & Kuehn, P. (1990). The relationship between overall reading comprehension and comprehension of coreferential ties for second language readers of English. TESOL Quarterly 24(2):267-292.

Table 1. Determiners in English

Predeterminers	Central Determiners	Postdeterminers
quantifiers (e.g., all)	articles (a, the, Ø)	cardinal numerals (e.g., two)
multipliers (e.g., both, twice, double)	demonstratives (e.g., this)	ordinal numerals (e.g., first)
fractions (e.g.,half, one-third)	possessives (e.g., my, John's)	general ordinals (e.g., next)
intensifiers (e.g. what, such)	assertive/nonassertive (e.g., some)	quantifiers (e.g., many, few, several, little)
	negative (i.e, no)	
	universal (e.g., each)	
	nonassertive dual (i.e., either)	
	negative dual (i.e., neither)	
	wh-determiners (e.g., which)	

Table 2. Research Reports Analyzed for Determiner Usage

Biology
a. Sampling techniques, spatial distribution and cultural control of millet spike worm, *Raghuva albipunctella* (Noctuidae: Lepidoptera) (Gahukar 1990)
b. Effect of cutting on production and tillering in prairie grass (Bromus willdenowii Kunth) compared with two ryegrass (Lolium) species. 2. reproductive plants (Hume 1991)

Chemistry
a. Zwitterion and diradical tetramethylenes as initiators of "charge-transfer" polymerizations. Hall et al. (1990).
b. Vibrationally induced dynamics in hydrogen-bonded complexes (Miller 1990)

Clinical Psychology
a. Stress management approaches to the prevention of coronary heart disease (Bennett et al. 1990)
b. The role of attributions in self-poisoning (Jack et al.1991)

Computer Science
a. PAWS: A performance evaluation tool for parallel computing systems (Pease et al. 1991)
b. Address tracing for parallel machines (Stunkel et al.1991)

Engineering (Mechanical)
a. Performance evaluation of four-bar linkages for rigid-body guidance based on generalized coupler curves (Angeles et al.1991)
b. Topical analysis of single-degree-of-freedom planetary gear trains (Olsen et al.1991)

Geology
a. New faulting and the attenuation of fault displacement (Collins 1990)
b. Reservoir induced seismicity near Heron and El Vado Reservoirs, Northern New Mexico (El-Hussain et al.1990)

Medicine
a. The effect of epilepsy or diabetes mellitus on the risk of automobile accidents (Hansotia et al. 1991)
b. Molecular basis of different forms of metachromatic leukodystrophy (Polten et al. 1991)

Physics
a. Model-independent description of intermediate-range forces in static spherical bodies (Ponce de Leon 1990)
b. The magnetic propoerties of the oxygen-hole aluminum centres in crystalline SiO_2.IV.$[AlO_4/Na]^+$ (Dickson et al. 1990)

Non-EST
a. The discourse of computer-assisted language learning: toward a context for descriptive research (Chapelle 1990)
b. The relationship between overall reading comprehension and comprehension of coreferential ties for second language readers of English (Carson et al.1990)

Table 3. Possessive Determiners in the EST Corpus (in Percents)

my	(0.5)	his	(1.6)	their	(47.0)
our	(15.1)	her	(0.5)		
your	---	its	(35.1)		

Figure 1. Percentage of Determiners Per Total Words

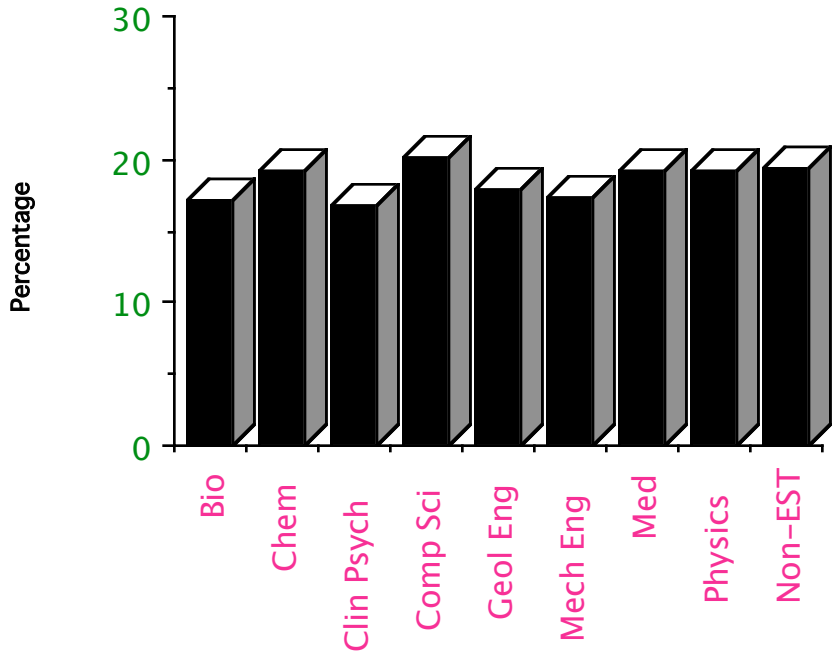

Figure 2. Articles vs. Other Determiners

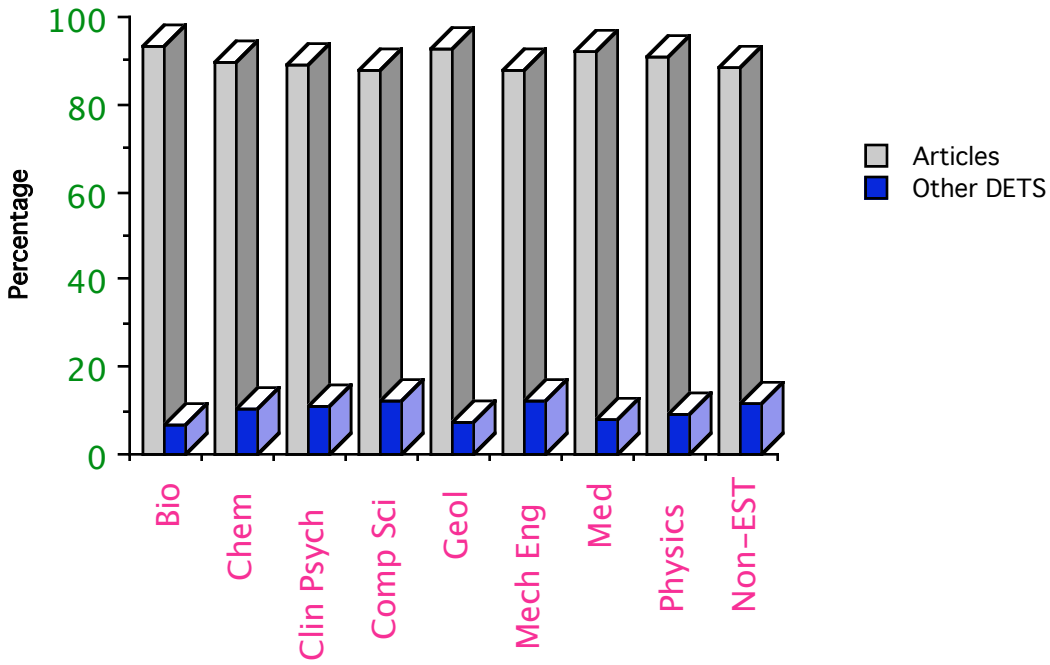

Figure 3. Distribution of the Articles: a, Ø, the

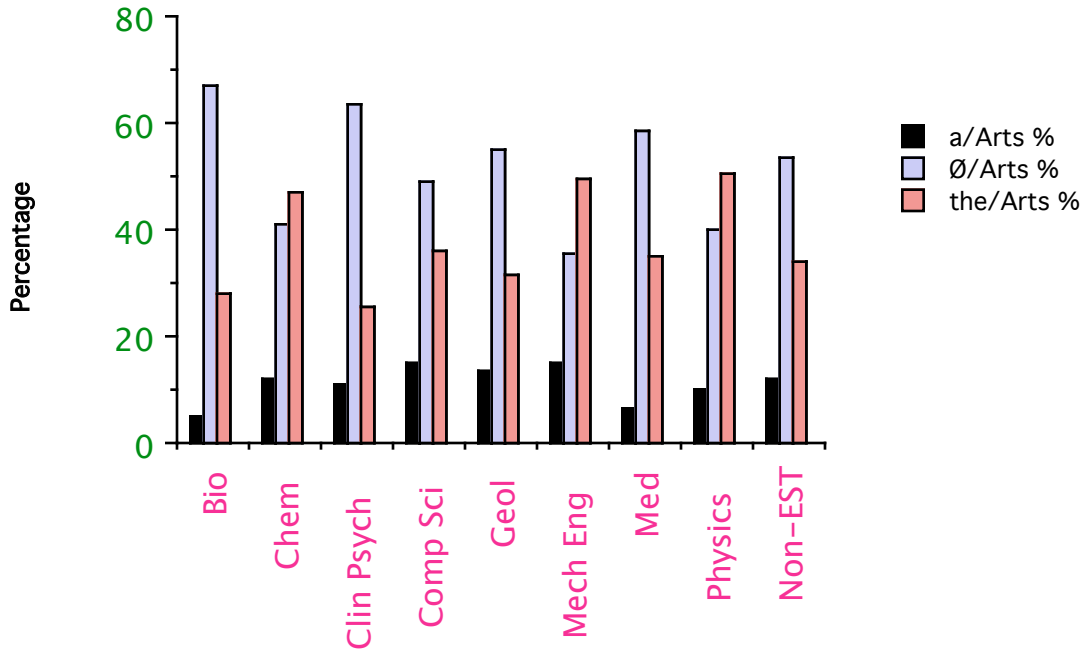

Figure 4. Distribution of the Demonstrative Determiners

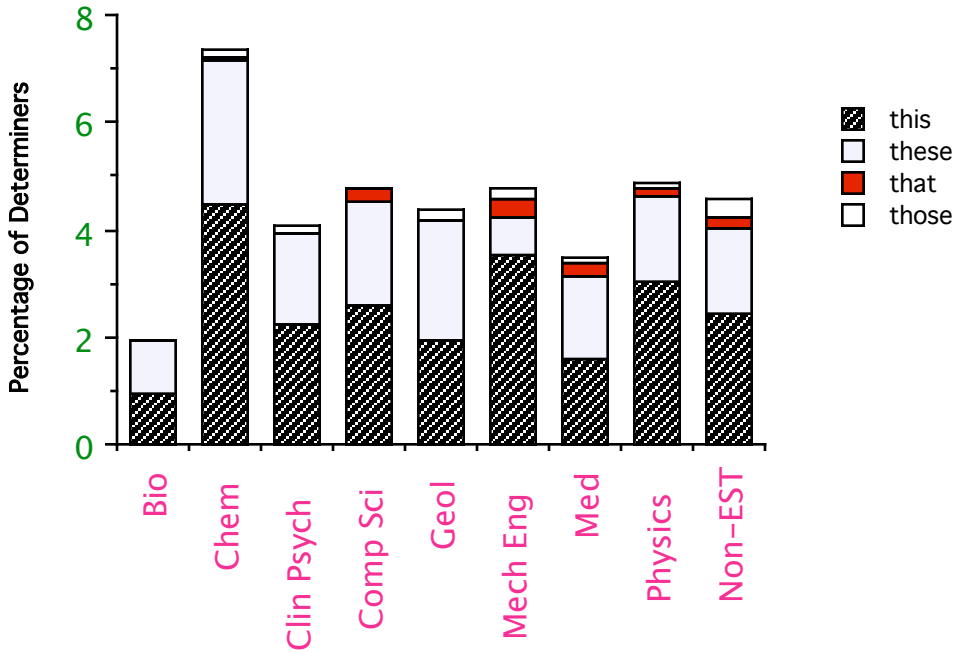

Figure 5. Distribution of Possessive Structures

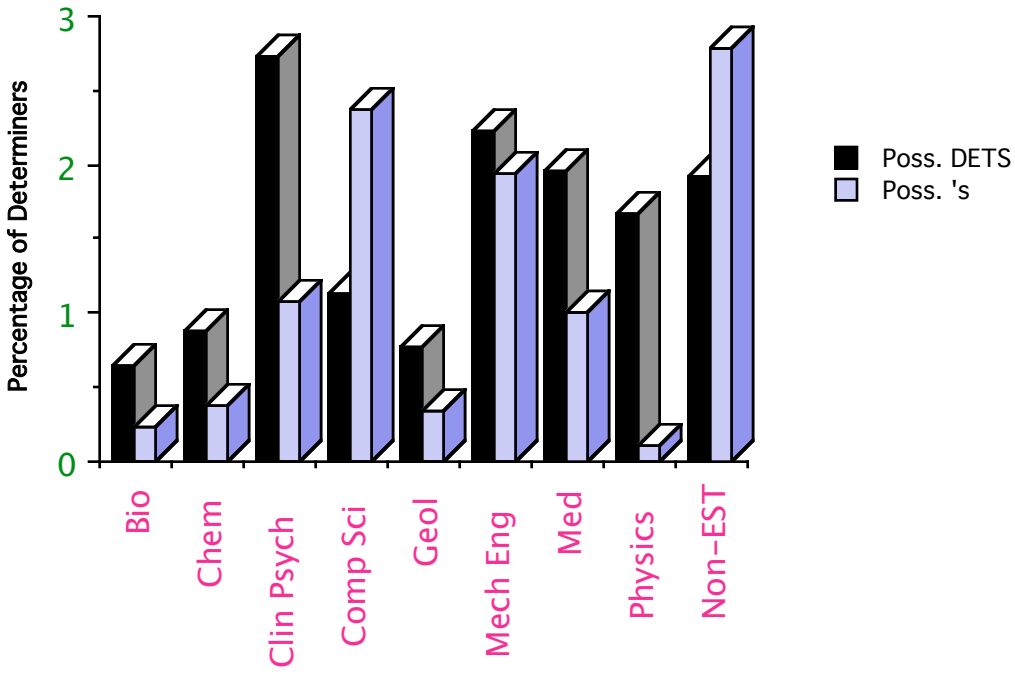

Figure 6. Distribution of Some and Any

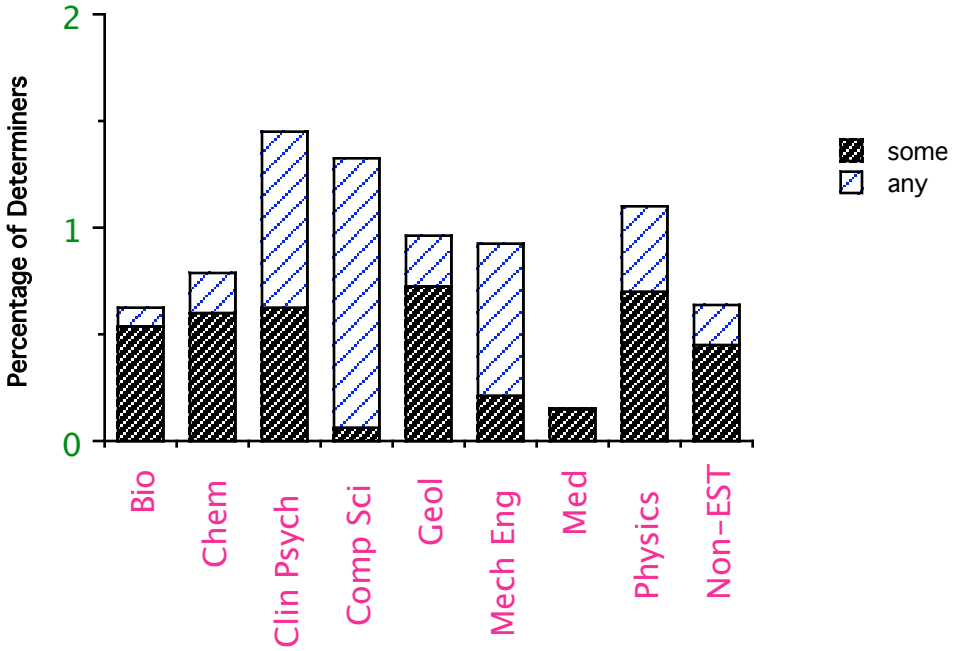

Figure 7. Distribution of No

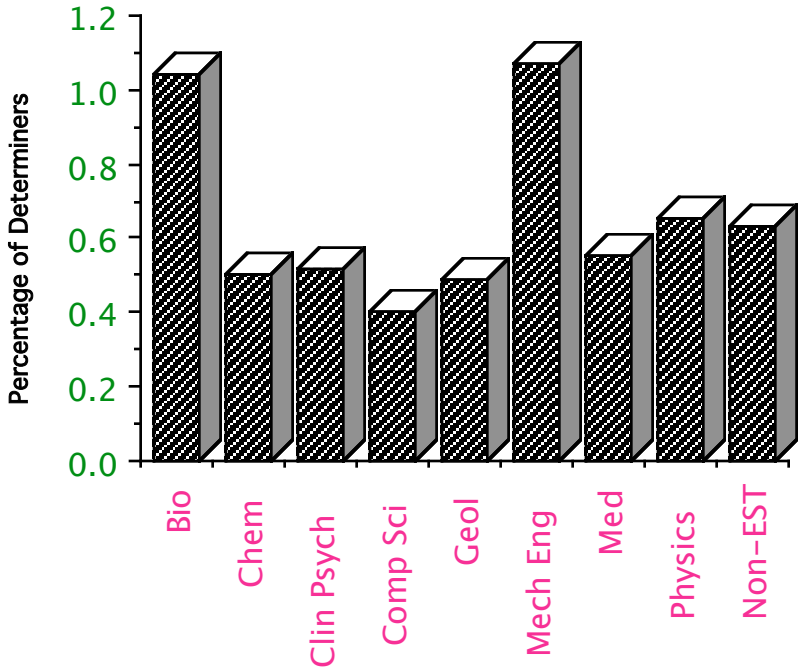

Figure 8. Distribution of Each, Every, Either and Neither

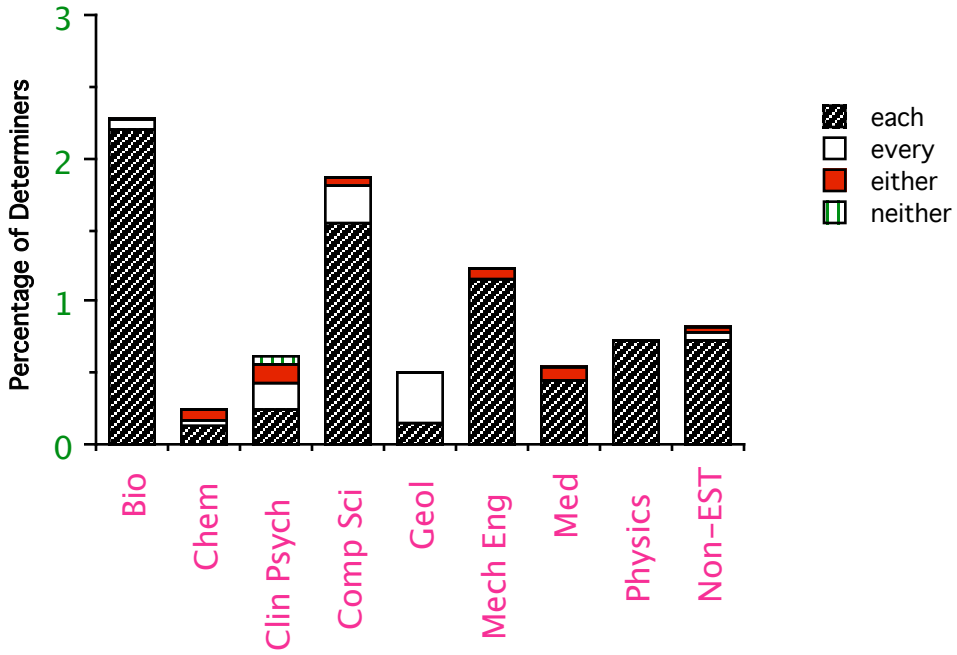

Figure 9. Distribution of Which, What and Whose

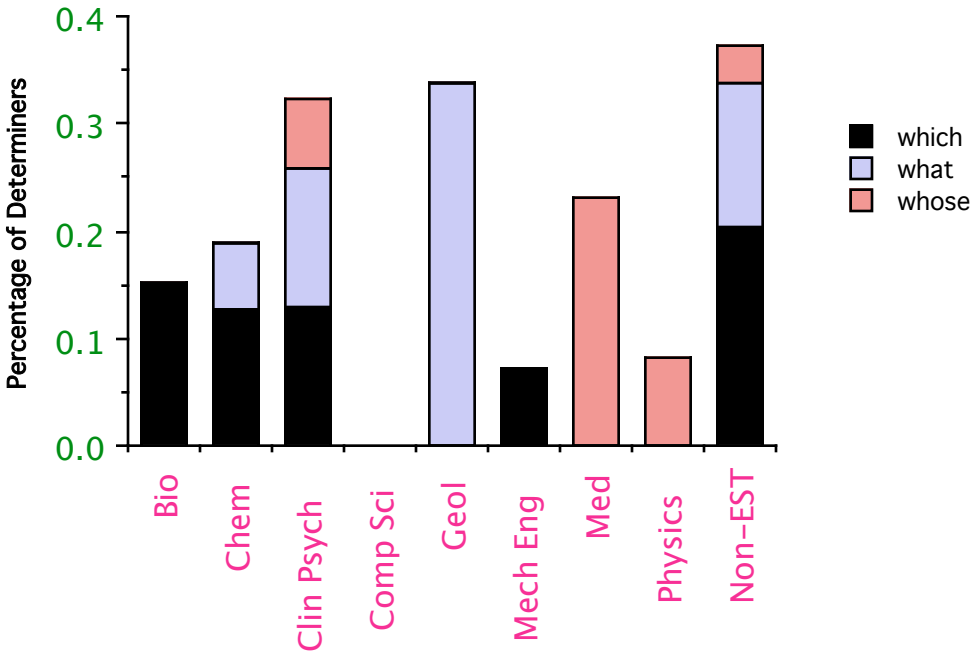

Figure 10. Comparison of RAs with Other Genres

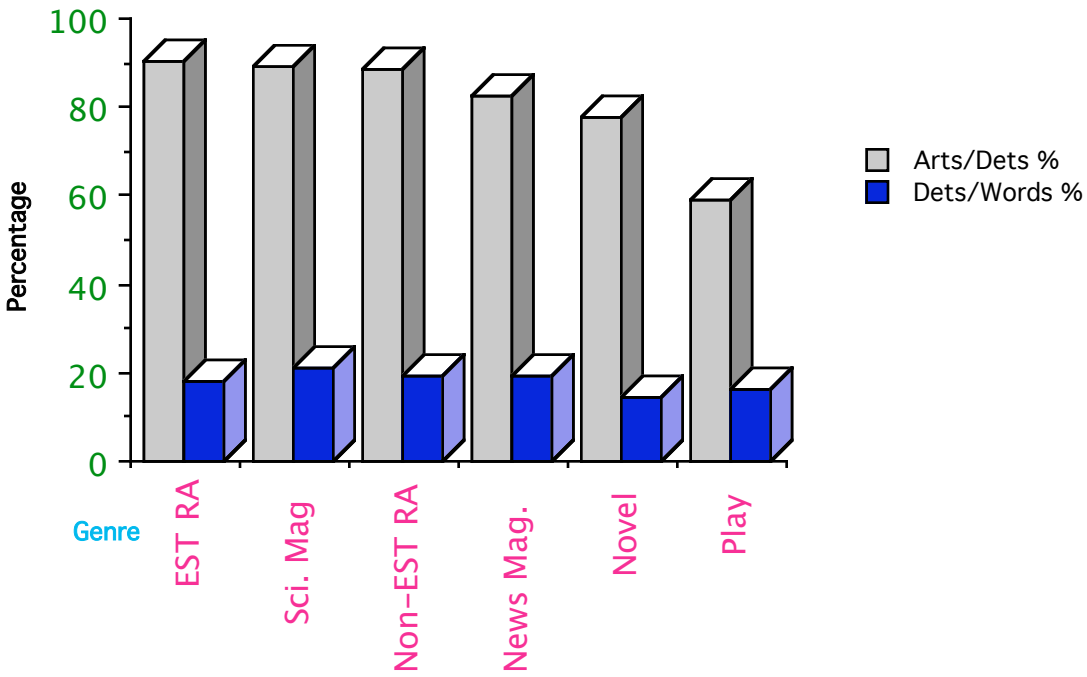

Figure 11. Comparison of Article Distribution in EST and non-EST RAs

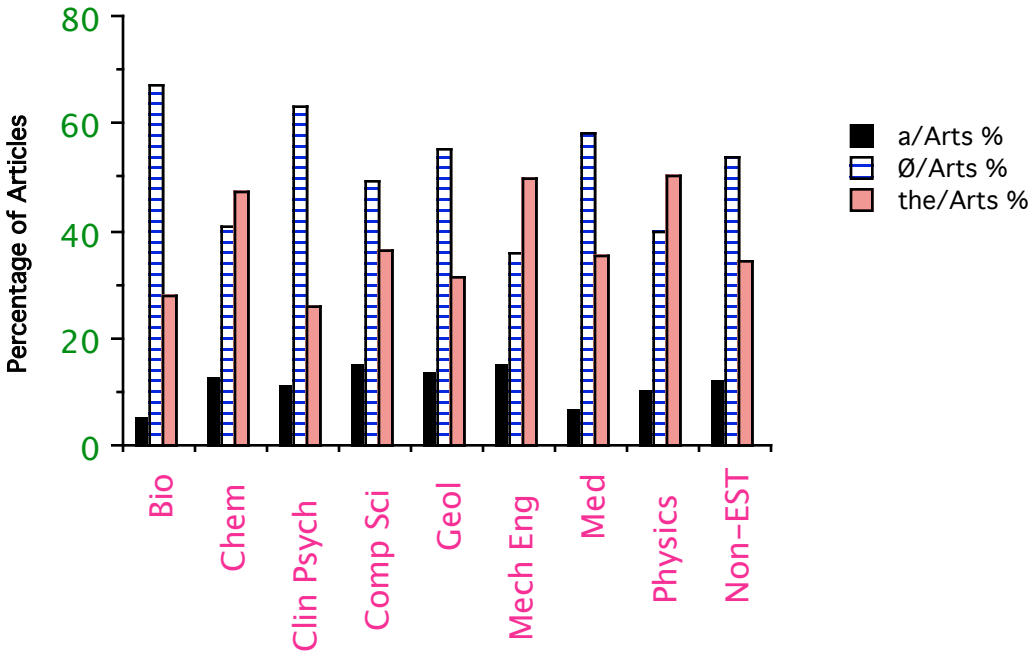

Figure 12. Comparison of DETS in EST and Non-EST RAs

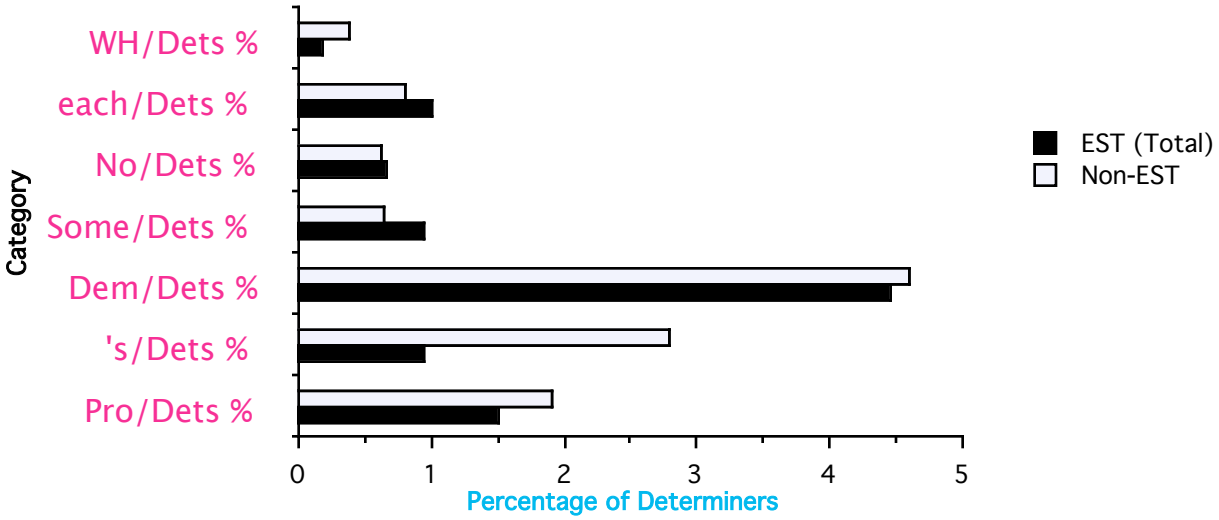

Figure 13. Article Use in Life & Physical Science and Non-EST RAs

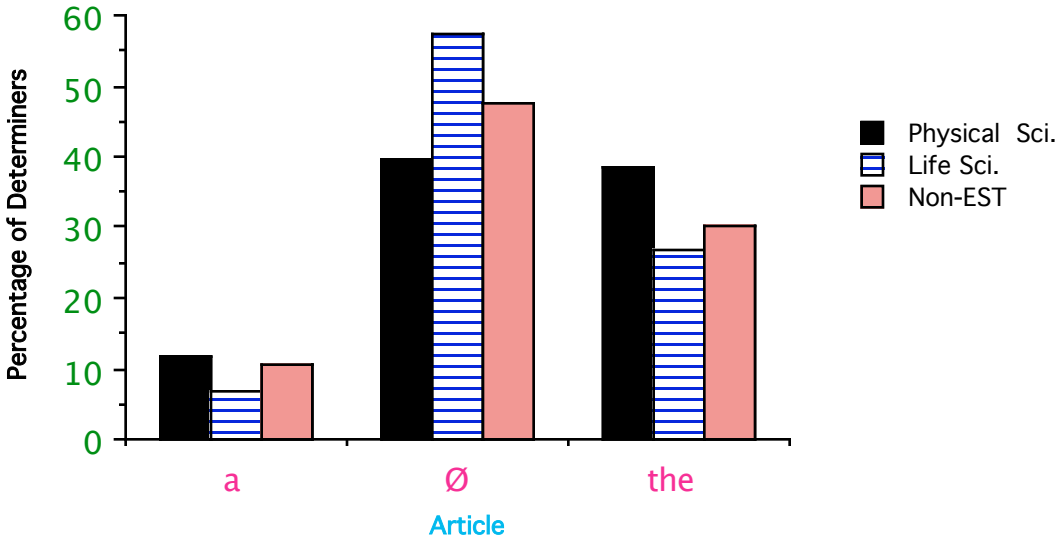

Figure 14. Comparison of RAs with Goodman's Analysis