Signalling nouns in discourse

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Abstract

This paper presents a description of a major class of vocabulary, signalling nouns, which have important discourse functions in establishing links across and within clauses. This class of noun is particularly prevalent in academic discourse. The description is based on a reading of the literature and, more importantly, the author's own corpus data. The synthesis represents the first attempt to bring this diverse work together under one umbrella. The description provides a framework which is likely to be of value to materials writers and teachers and learners in English for Academic and Specific Purposes.
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One of the first steps in the analysis of any discourse must be the identification of the lexical signalling present in it. Lexical signals are the author's/speaker's explicit signalling of the intended organisation and are therefore obviously of primary importance; it is probable that they are one of the main means whereby a reader/listener 'decodes' a discourse correctly. (Hoey, 1983, p. 63)

It is evident that we have only just begun the proper description of signalling in discourse. (Hoey, 1993, p. 82)

1. Introduction

This paper seeks to develop a pedagogically appropriate description of an important word class, referred to here as "signalling nouns", the study of which has been going on for many years now, but for which there exists, to date, no comprehensive account, either linguistic or pedagogic. A signalling noun is potentially any abstract noun, the meaning of which can only be made specific by reference to its context. Examples of signalling nouns are **attitude, assistance, difficulty, endurance, process,**

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reason, result, etc. Various aspects of this type of vocabulary have been referred to in the literature as *general nouns* (Halliday & Hasan, 1976), *type 3 vocabulary* (Winter, 1977), *anaphoric nouns* (Francis, 1986), *advance labels* (Tadros, 1985), *carrier nouns* (Ivanic, 1991), and *metalanguage nouns* (Winter, 1992). Each of these is a sub-category of the larger class of abstract nouns, all of which potentially have this signalling function. There has been no comprehensive treatment of this larger class, however. The goal of the proposed research is therefore to occupy this research niche and develop an integrated treatment of this larger class of abstract nouns (*signalling nouns*).[1]

Each of the following citations (1) and (2) contains an example of the sort of lexis which fulfils the signalling function with which this paper is concerned.[2] In both examples the word **fact** signals a relation with its adjoining clauses; in the first example **fact** refers forward (cataphorically) to the series of clauses which follow it; in the second it refers back (anaphorically) to the two clauses which precede it:

1. This theory leaves a number of **facts** unexplained. For example, starch is absent from the guard cells of certain plants; some guard cells lack chloroplasts but still open and close; and the stomatal movements of some plants may not necessarily be related to the time of day;...

2. Electricity is used to drive the motor of an electric train, but inevitably some of the energy is lost as heat. This unavoidable **fact** is of great importance in biology.

In addition to relating across clauses, signalling nouns can also be realised within the clause (see later) and exophorically.

Signalling nouns are likely to be problematic for non-native, as well as native, speakers, for a number of reasons; these reasons relate to questions of cognitive complexity, on the one hand, and pedagogic practicality, on the other:

Reasons for cognitive complexity:

a. Signalling nouns refer to abstract entities and are thus removed from the concrete world of reality.
b. The realisation of signalling nouns must be sought out both within and outside the clause in which they occur, as well as through mutual background knowledge.
c. Signalling nouns introduce additional propositional density to a text.

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[1] Since acceptance of this article for publication a book has been published which does attempt a comprehensive treatment: Schmid (2000).
[2] These examples are from the corpora described under "Method".

Reasons for pedagogic practicality:

a. Signalling nouns are pervasive in academic language (Cullip, 2000; Nation, 1990; Thurstun & Candlin, 1998). As an initial indication of how frequently signalling nouns occur in academic writing, for example, out of 281 lexical items with the initial letter "a" in the *Academic Word List* (Coxhead, 2000), 70 are used as signalling nouns in the Brown Corpus.[3] The data presented in the empirical part of this paper will also highlight the pervasiveness of signalling nouns.

b. There is no comprehensive pedagogically useful description of the form and function of signalling nouns in English on which to base teaching and learning.

c. As a result, little attempt is made to deal with lexical signalling nouns in pedagogy.[4]

As an indication of some of the problems with signalling nouns for non-native speakers, in a small-scale empirical study, Francis (1988), found that Singaporean students tended to use signalling nouns (referred by her as advance and retrospective labels, respectively) less frequently than native speakers, to use a smaller range of items, and to use less modification. In addition, she found examples of inappropriate use. For example "this human factor" was used to encapsulate a foregoing complaint about overcrowded canteen conditions. Furthermore, she found evidence of inappropriate collocation between lexical signal and modifier, for example, "this intolerable phenomenon".

2. Method

The research is based upon two corpora. The first of these consists of transcribed recordings of an undergraduate lecture course in biology (92,939 words) given at Sultan Qaboos University (SQU) by native speaker lecturers to non-native (Arab) audiences. The second corpus was made up of the relevant sections of the prescribed textbook for the lecture course (Roberts, 1986) upon which the lectures were based (90,482 words). Both corpora, therefore, covered the same subject matter. The range of lecturers (12) contributing to the lecture corpus ensured that there was no problem with the features analysed being peculiarities of individual speakers' idiolect. To guard against this possibility with the book, a subsidiary corpus made up of five 1000-word samples was used to cross-check features identified in the main book corpus. The subsidiary book corpus was taken from Green, Stout and Taylor

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[3] Information from the Academic Word List (AWL) (available on line from www.vlc.polyu.edu.hk). The *Academic Word List* consists of 570 words that are reasonably frequent in a wide range of academic texts, but not so common in other texts (Coxhead, 2000). The Brown Corpus consists of 75% "factual writing" and 25% fiction.

[4] The limited ESL texts to specifically focus upon signalling nouns—which are presented as "general nouns" and "abstract nouns"—to the knowledge of this author are McCarthy, MacLean, and O'Malley (1985); McCarthy, O'Dell, and Shaw (1997). However, even here there is no focus on their cohesive function.

(1984), which, like Roberts, covers the British A-level syllabus. Text samples covering the same topics as the main book and lectures corpus were selected.

Halliday (1988, 1993) and others (Martin, 1991, 1992; Wignell, Martin, & Eggins, 1987) claim that much abstract written English, especially science, is characterised by high levels of nominalisation. It was hypothesised, therefore, that the written corpus chosen for the present study would be likely to yield a heavy usage of signalling nouns. While the emphasis of Halliday and others has been on the high frequency of nominalisation in written text, it was felt that the investigation of a spoken corpus, dealing with the same subject matter as the written text, would be interesting from the point of view of to what extent this phenomenon applies also to the spoken mode.

Winter (1977) and Tadros (1985) make it clear that nouns are not the only word class to fulfill a signalling role in discourse; verbs, adjectives and adverbs may also have such a function. Only nouns are dealt with in this study, however, because, following Halliday and others, nouns are likely to be particularly prevalent in the chosen corpora and for the practical reason of limiting the scope of the study to reasonable bounds. Any pedagogic treatment of lexical cohesion, of which signalling nouns are a part, should nevertheless ideally take into account the cohesive functions of all word classes, not just nouns.

Signalling items for the corpora were identified in a number of stages. First, lists of all the different words occurring in each corpus were created by means of a computerised word frequency programme. Then, all lexical items were concordanced by means of the Oxford-WordSmith Tools programme (Scott, 1999), and the concordance outputs were examined to establish if a given item functioned as a lexical signal. The WordSmith Tools, as with other concordancers, initially presents each concordanced item within a single line of context; but it has the advantage of an additional on-screen function which then allows the analyst to view any selected item within the wider context of the whole text—important for evaluating the potential cross-clause relational function of signalling lexis.

Due to the fact that potential lexical signalling items can have more than one function, the next stage was to sort the concordances by hand, eliminating non-signalling items, i.e. homographs, and to divide the remaining items into those which were realised across clauses, those that were realised within the clause, and those which were exophoric. The WordSmith Concord allows this editing to be carried out on screen and the results then saved as text files.

The following examples from the corpora show the four categories for the item **way**:[5]

Homograph

3. While the amniotic cavity is being formed, a further cavity develops. This arises as an outgrowth from the hindgut which pushes its **way** into the extraembryonic coelon.

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[5] Throughout the paper examples from the book have traditional punctuation, whereas those from the lectures are "punctuated" with forward slashes (/) to indicate tone groups. In this way, any example can immediately be recognised as coming from either the book or lecture corpus.

meaning realised within the clause

4. The quickest **way** of doing this in the case described above is to set up a group of enucleated Amoebae, perhaps fifty in the entire experimental group...

meaning realised across clauses, anaphoric

5. In the case illustrated in Fig. 3.1. the secretion is released from the free surface of the cells. Mucus is secreted this **way**, as is sweat from the sweat glands in the skin.

exophoric: there is nothing earlier or later in the text to realise a specific meaning of "way"

6. / now this is paramecium stained in a different **way** / not to show what's inside in cytomplasm/ but to show the cilia on the pellicle /

3. Results

3.1. Discourse functions

In terms of cognitive processing, signalling nouns stimulate a cognitive process whereby the meaning of a given signal must be sought either earlier in the text (in a previous clause or clauses or as premodification within the signal's noun group), or later in the text (in a following clause or clauses or as post-modification within the noun group), or outside the text, as assumed background knowledge (exophoric reference).

3.1.1. Across clauses

Most researchers, have focussed on the cross-clause pattern, emphasising either cataphoric or anaphoric signalling. [Winter's, 1977 paper, for example, was sub-titled "A study of some **predictive** lexical items in written discourse"; Tadros's monograph was entitled "**Prediction** in Economics Text", while Francis's mono-graph was titled **Anaphoric** Nouns" (emphasis added)]. On the basis of the evidence from the biology corpora, both cataphoric and anaphoric signalling are important [although the anaphoric function is more frequent (see later)] and seem to be closely inter-related. The cataphoric function is exemplified in the following example from the lecture corpus:

7. /.../ there is a very big **change** in concentration / the angle is steep like a steep hill here / it is shallow and from the same distance from here / ...

The lexical item **change** here indicates to listeners that they should prepare them-selves to receive information which will indicate the nature of this change, an indi-cation which is indeed fulfilled in the pair of clauses which follows. In placing the noun phrase containing the signal **change** at the end of the first clause (as rheme; see Halliday, 1985), the speaker emphasises its importance as a carrier of new information

[principle of end focus, (Quirk, Greenbaum, Leech, & Svartvik, 1985)]; once the signal **change** is established as given, the subsequent clauses can emphasise the nature of the change, by placing its attributes —"steep like a steep hill here"; "shallow and from the same distance from here"—as rheme in the two subsequent clauses (again principle of end focus). This information structure is common with signals in the cataphoric function:

8. Internal fertilization has two great **advantages**: (1) it is a surer method with better chances of sperm meeting eggs; (2) it means that the fertilised egg can be enclosed within a protective covering before it leaves the female's body ...

In this example, the signal **advantages** receives end focus as new information in the rheme of the first clause; **advantages** having been accepted as given, the nature of the **advantages** —"a surer method with better chances of sperm meeting eggs" and "the fertilised egg can be enclosed within a protective covering before it leaves the female's body"—can then be emphasised by receiving end focus as rhemes of the following two clauses.

The next example illustrates the anaphoric function:

9. Clinging to outmoded hypotheses is an occupational hazard in those branches of biology where it is difficult, perhaps impossible, to test predictions experimentally and thus settle the matter once and for all. Such is the **case** with paleontology and certain branches of animal behaviour.

Here the item **case** encapsulates the meaning of the preceding stretch of discourse and labels it as a **case**, establishing it, in terms described by both Francis (1986) and Ivanic (1991), as given information which can be developed in the subsequent stretch of discourse.

The following example shows clearly this function of anaphoric signals of establishing the meaning of a stretch of discourse as given and at the same time providing the starting point for new information:

10. (following a discussion of the very rapid rate of increase in scientific knowledge) ...In fact the **explosion** in scientific knowledge prompted a former President of the Royal Society to remark that nowadays the only item on the agenda which all Fellows of the Society can be guaranteed to understand is the statement that tea will be served in the lounge at 4 p.m.

The next example has both an anaphoric signal, **view**, which establishes the meaning of a preceding stretch of discourse as given, and a cataphoric signal, **idea**, which labels the new stretch of discourse which follows:

11. Like many generalisations, the cell theory has been greatly overworked to the point that it is taken by some biologists to mean that the cell is the most

important unit, the whole organism being little more than a collection of independent though co-operating cells. As a reaction to this extreme **view** a rival **idea** has grown up, the organismal theory, which proposes that the whole organism is the basic entity and the cells merely incidental sub-units.

The examples given to illustrate the cataphoric and anaphoric functions of signalling nouns have been chosen for their relative simplicity in terms of matching the lexical signal to the stretch of discourse which it labels. Many examples in the corpus, however, are more complex in this respect. In the next example, the speaker refers his listeners back to the previous semester's lectures, when **differences** between animals and plants had been discussed, and at the same time signals that these **differences** will be reiterated in the following stretch of discourse, by his audience and/or himself:

12. (referring back to the previous semester's lectures) / now we did discuss the differences between animals and plants / and I think we had quite a long list / but can any of you remember some of the important **differences** between animals and plants // STUDENT UTTERANCE // oh / listen to that / perfect answer / plants are autotrophic / . . . /

Another more difficult use of signalling nouns from the point of view of identifying their referents is when they point forward or backwards to some stretch of discourse which is remote from the signals and is not specified:

13. Thus the two long chromosomes are attached to different fibres of the spindle, as are the two short chromosomes. The **significance** of this will become clear later.

14. This kind of division generally takes place in the formation of gametes, though in some organisms it may occur in the formation of spores. Its full **implications** will be discussed later.

Sometimes across-clause signals may be accompanied by modification, as in the following example:

15. Sixty years ago biologists were preoccupied with describing the structure and general form of animals and plants—anatomy and morphology. But in more recent times there has been a shift of interest towards the way organisms function, resulting in the development of animal and plant physiology. During the last forty years or so such **functional studies** have become more and more chemical . . .

Modification of signals will be discussed in greater detail later in their in-clause realisation pattern. However, it is to be noted here that sometimes the modification

may be of more semantic importance than the signal which it modifies. In the example presented here, the writer labels what he has been referring to as **studies**, but it seems that the modifier, **functional**, is what the writer wants to prioritise in terms of his message. It is the fact that these studies are **functional** (in contrast to the **structural** studies which were referred to earlier) that is important, not the fact that they are **studies**. The main role of the signal **studies** here is in creating an information structure in which the item **functional** can be introduced into the discourse and made salient; its main function is not to attach a propositional label to the preceding stretch of discourse.

3.1.2. Within the clause

In terms of structure, when signals are realised within the clause, the clause is a relational one, with the lexical signal as subject and the realisation as complement in the form of a nominal clause introduced by a preposition such as **that** or **to**, or a deverbal noun.

that
16. The **reason** why they're green is **that** they have chlorophyll.
to
17. / the flower is the reproductive part of the plant / it contains the male and usually male and female parts of the plant / and the **function** is **to** produce seeds which will then grow into new plants /
deverbal noun
18. Another important structural **characteristic** of monosaccharides is the **occurrence** of isomerism.

In this form, note also how the signalling noun is usually pre- or post-modified in such a way as to make its reference more specific: **the reason <u>why they're green</u>**, **The function <u>of androgens</u>**, **<u>Another important structural</u> characteristic**

The in-clause realisation may also occur in apposition:

19. Lack of vitamin D in children causes rickets, a **condition** in which the bones fail to harden and become deformed

In a different structure, in a considerable number of instances, the signalling noun functions as complement, with its realisation split between the subject and its own post-modification:

20. Diffusion is a **process** where the molecules go from an area of high concentration to the area of low concentration until you get equilibrium

21. One might sum all this up by saying that a living organism is a self-reproducing **system** capable of growing and of maintaining its integrity by the expenditure of energy.

This is a form, not mentioned in the literature, the occurrence of which may be related to the scientific nature of the corpus. The structure corresponds to the classic form of the formal definition, "term" + "class" + "characteristic", where term is in subject position, and class and characteristic act as complement (Flowerdew, 1992). Signals which occur in this form include **condition**, **phenomenon**, **process**, **property**, **structure**, and **system**, etc. The ordering of the elements in definitions like these can vary. Thus, in the following example we have the ordering of "characteristic" + "class" + "term", in a form sometimes referred to as "nominal" definition:

22. After several days the blastocyst becomes embedded in the lining of the uterus, a **process** called **implantation**.

As discussed in Flowerdew (1992), the ordering of the elements in definitions relates to their position within the surrounding discourse and which elements may be given or new.

Realisation of a signal within the clause can also be at the level of the noun group. This most often takes the form of post-modification:

a **process of internal propagation**

its **function of providing mechanical strength**

a **shift of interest towards the way organisms function**

the **advantage of being simple and portable**

a **theory that is generally accepted that mitochondria found in animal and plant cells were originally bacteria that were living in the cytoplasm of plant and animal cells.**

In some (many fewer) cases, realisation within the clause is performed by a pre-modifier:

a **crazy-paving appearance**

a **pumping action**

a **highly dessicated state**

the **division process**

the **homeostatic function**

In many of these cases, however, the pre-modifier may provide only part of the realisation, the rest lying elsewhere in the discourse. In the following example,

although the pre-modifier, **division**, specifies the signal, **process**—in part—much more information on the nature of the process is contained in the clauses which follow:

23. How does meiosis achieve this halving of the chromosome number? The answer lies in the behavior of the chromosomes during the **division process**. Meiosis consists of two successive divisions: the parent cell splits into two (first meiotic division) and the products then divide again (second meiotic division), giving a total of four daughter cells. . . .

3.1.3. Exophoric function

Sometimes, as Ivanic (1991) has noted, a signal cannot be recovered in the discourse, but appeals to background knowledge (exophoric reference).

24. An organ system . . . is very effective and can carry out many important **tasks** . . .

Here, the item **tasks** is not realised in the text. It is left to readers to work out what sort of tasks the writer is referring to, by using their existing knowledge of the sort of tasks an organ system might carry out. Similarly, in the next example, it is up to readers to infer what **extensiveness** and **ramifications** the author has in mind; they are not specified in the text:

25. It is only necessary to glance through the current issues of the British scientific journal, Nature, or its American equivalent to appreciate the **extensiveness** and **ramifications** of biology, both pure and applied.

As Ivanic (1991) points out, again, the application of background knowledge in cases such as these is not optional, but an essential part of the comprehension process. As Alderson and Urqhart (1985) have demonstrated empirically, the higher the level of background knowledge readers (or listeners) bring to a text, the better they comprehend it. In this way, signalling nouns function like pronouns, indicating to listeners/readers that they must look for what the signal refers to, whether this be in the clause, elsewhere in the text, or outside the text.

In the next example, in an unwitting acknowledgment of the role of background knowledge in the processing of signalling nouns, the speaker overtly encourages listeners to bring their background knowledge to bear in interpreting the signals **purposes** and **functions**:

26. / so think about that as we discuss the structure of plants / try and think about the **purposes** and the **functions** of many of these structures we'll be talking about /

Here the speaker makes it clear that he is not going to provide the realisations for **purposes** and **functions**. In the two preceding examples, however, it is not clear whether

realisations for the items **extensiveness** and **ramifications**, on the one hand, and **tasks**, on the other, will be provided by the author. In terms of cognitive processing, therefore, the anticipation is set up and it is up to the readers to decide that it is not going to be realised and that they therefore have to bring background knowledge to bear in the interpretation of these items.

The previous comments about the need to invoke background knowledge notwithstanding, it does seem that different contexts vary in the extent to which this is necessary. In the following example, for instance, it seems that understanding will not be impaired if readers do not use their background knowledge to realise the full meaning of the signal **advantages**:

27. Some biologists feel that the name protist- traditionally associated with unicellular organisms- should not be used for this expanded group and so it has been suggested that this kingdom should be called the protista. This modification of Whitakker's original five kingdom system has certain **advantages** but it will not be used here.
(note also that **modification** is a signalling noun in this citation)

In a few cases, a signal may be used in a negative clause. In such cases readers/listeners still need to look for a realisation of the signal, but the negative particle indicates that the realisation will have a contrary meaning to that of the signal. Thus in the following examples, the signal **no real difficulty** is realised by clauses describing an **easy** process; the signal **no problem** is realised by clauses pointing to an advantage:

28. /.../ the soluble waste in solution can diffuse from the inside to the outside very easily / so there is **no real difficulty** with the elimination of soluble waste / ...

29. / small organisms get all their oxygen just by diffusion in from the outside / for example paramecium is a small single cell organism / **no problem at all** / and the carbon dioxide diffuses out into the water again / ...

3.1.4. Frequency and range

Having described and exemplified the various functions of signalling nouns, data relating to the frequency and range of these items of the two corpora used in this study will be presented. Given the relatively small size of the corpora and their register specificity, care must be taken in assigning any generalisations to the frequency and range of signals here.

3.1.4.1. Frequency. Table 1 shows average frequency of lexical signalling items per thousand words for the two main corpora and the subsidiary book corpus. The figures were arrived at by calculating the average frequency of items for five 1000-word samples occurring at regular intervals in each of the two main corpora and for the five text samples making up the subsidiary book corpus. The table shows that there

Table 1
Average signaling items per 1000 words

	Book (Roberts)	Book (Green et al., 1984)	Lectures
Average signalling items per 1000 words	20	17	9

Table 2
Frequency of the six most common signaling items in the corpora

	Book				Lecture			
	Total	across	In	exo.	Total	across	in	exo.
Function	134	91	40	3	130	89	36	5
Way	125	89	24	12	148	76	35	37
Result	66	19	37	10	0	0	0	0
Case	91	55	10	26	35	25	8	2
Effect	48	19	18	11	3	1	1	1
Kind	60	31	6	23	163	110	20	33

are on average 20 signals per thousand words in the main book, 17 in the subsidiary book corpus, and nine in the lectures.

Table 2 shows the frequency of some of those items most often used in a signalling function, with a break-down according to across-clause, within-clause, and exo-phoric function. Table 2 shows that certain lexical-signalling items can occur with great frequency. **Function**, for example, occurs in the book 134 times altogether: 91 times with an across-clause function, 40 times with an in-clause function, and three times in an exophoric function. **Function** occurs with only slightly less overall frequency in the lectures: 130 times total, including 89 times with across-clause function, 36 times with in-clause function, and 5 times with an exophoric function.

While **function** occurs with only slightly less frequency in the lectures than in the book, Table 2 also shows that there can be considerable variation in relative frequency for a given item across the two corpora. **Result**, for example, is quite frequent in the book, but does not occur at all in a signalling function in the lectures. **Effect**, similarly, occurs only three times as a lexical signal in the lectures, but is used considerably in the book.[6]

While, as seen in Table 1, the book has a higher total average number of occurrences of signalling nouns per 1000 words of text, Table 2 shows that while in most cases, and consistent with Table 1, there are more instances of any given item in the book than the lectures (**function**, **way**, **result**, **case**, **effect**), in some cases a given item

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[6] A possible reason for this phenomenon is that the lectures use a less formal style. Instead of saying something like "The **result** of X is Y" (signalling noun), a lecturer might prefer something like "If we do X then we end up with Y" (no signalling noun).

Table 3
Signalling items in the Book corpus

Book

accident, account, action, activation, activity, adaptation, adaption, advance, advantage, analogy, analysis, appearance, approach, argument, arrangement, aspect, association, assumption, attraction, basis, case, category, cause, change, characteristic, choice, circumstance, classification, coincidence, combination, comparison, complexity, composition, concept, condition, configuration, connection, consequence, consideration, constituent, context, content, contrast, controversy, converse, conversion, correlation, criterion, cycle, danger, description, detail, deviation, difference, difficulty, dilemma, discovery, discussion, distinction, divergence, diversity, division, effect, emphasis, endeavour, evidence, example, exception, exchange, explanation, explosion, fact, factor, feature, field, form, function, generalisation, idea, implication, indication, influence, instance, interpretation, item, kind, knowledge, manner, means, mention, method, modification, movement, objection, observation, occasion, operation, part, pattern, phenomenon, point, piece, position, prediction, principle, problem, procedure, process, progress, property, purpose, question, ramification, range, reaction, reason, regard, relationship, respect, result, role, scheme, section, selection, sequence, series, shape, shift, significance, similarity, situation, size, split, solution, sort, stage, state, statement, step, structure, studies, subject, success, suggestion, support, survey, system, task, technique, tenet, theory, thesis, thing, topic, treatment, trend, truth, type, uniformity, use, variety, view, viewpoint, way, work, zone
(Total: 166 words)

can occur more frequently in the lectures than in the book. **Kind**, for example, is very frequent in the lectures (163 total: 110 across-clause, 20 in-clause) but is much less frequent in the book (60 total: 31 across clause, six in-clause).

Another feature of Table 2 worthy of note is that there is considerable variation in the proportion of the two functions (across-clause and in-clause) that a given item can play. Most instances of **function**, for example, are in the across-clause usage (91 for the book; 89 for the lectures)—more than double the number for the in-clause function (40 for the book; 36 for the lectures). **Result**, on the other hand, is more frequent in the book in the in-clause usage (19 across clause; 37 in-clause), while not occurring at all as a lexical signalling item in the lectures.

3.1.4.2. Range. Although Table 2 shows that certain lexical signalling items occur with considerable frequency, it must be emphasised that many of them have a relatively low frequency, some of them occurring only once or twice in the two corpora. In relation to pedagogy, of course, the differing frequencies of the various items suggests a criterion for selection and grading for teaching.

Table 3 (Book) and Table 4 (Lectures) show all of those items identified in the book and lecture corpora, respectively, as fulfilling a lexical signalling function.

One-hundred and sixty-six different items were identified as fulfilling the signalling function for the book and 112 for the lectures. Although, as Tables 3 and 4 show, a considerable range of items function as signalling nouns, given the low frequency of many of them, as noted earlier, it is probable that larger corpora would be likely to yield an even wider range of items, a possibility made more likely by the considerable number of items which occur in only one of the two corpora. Table 5 includes those items which occur in only one of the two corpora.

Table 4
Signalling items in the Lecture corpus

Lectures

action, activity, appearance, argument, arrangement, aspect, attack, bit, branch, calculation, case, category, cause, chance, change, characteristic, class, classification, comparison, completion, complication, components, concentration, condition, confusion, constituent, control, cycle, description, difference, difficulty, dimension, distribution, division, example, extension, fact, feature, force, form, formation, function, grouping, growth, heading, illustration, information, kind, lengthening, limit, manner, meaning, means, method, mistake, movement, name, need, object, part, pattern, plan, point, position, possibility, preparation, problem, process, product, property, purpose, question, range, rate, reaction, reason, recapitulation, relationship, requirement, respect, response, reverse, rise, role, rule, selection, sequence, shape, similarity, situation, size, sort, stage, state, step, structure, suggestion, system, task, technique, technology, test, theory, thing, time, type, usage, use, variety, warning, way, work,
(Total: 112 words)

Table 5
Items occurring in only one of the two corpora

Book only

accident, account, activation, adaptation, adaption, advance, advantage, analogy, analysis, approach, association, assumption, attraction, basis, choice, circumstance, coincidence, combination, complexity, composition, concept, configuration, connection, consequence, consideration, context, content, contrast, controversy, converse, conversion, correlation, criterion, danger, detail, deviation, dilemma, discovery, discussion, distinction, divergence, diversity, effect, emphasis, endeavour, evidence, exception, exchange, explanation, explosion, factor, field, generalisation, idea, implication, indication, influence, instance, interpretation, item, knowledge, mention, modification, objection, observation, occasion, operation, piece, phenomenon, prediction, principle, procedure, progress, ramification, regard, result, scheme, section, series, shift, significance, split, solution, statement, studies, subject, success, support, survey, tenet, thesis, topic, treatment, trend, truth, uniformity, view, viewpoint, zone
(Total: 99 words)

Lectures only

attack, bit, branch, calculation, chance, class, completion, complication, components, concentration, confusion, control, dimension, distribution, extension, force, formation, grouping, growth, heading, illustration, information, lengthening, limit, meaning, mistake, name, need, object, plan, possibility, preparation, product, rate, recapitulation, requirement, response, reverse, rise, rule, technology, test, time, usage, warning,
(Total: 45 words)

As a further indication of the overall wide range of signalling nouns in elementary biology text, the following were all found in the 5000 word sample for the subsidiary book corpus, but did not occur in either of the two main corpora: **ability**, **convention**, **expansion**, **importance**, **theme.**

4. Pedagogic implications

Halliday (1993) has suggested how the development of science in the eighteenth century was accompanied by the development of a scientific discourse characterised

by, among other things, an increasing use of abstract nouns in the expression of processes and properties. This language of "events into things" (1993, p. 76) has been developed up to the present day and is the predominant register of the educational system, Halliday claims. This register, because it is removed from the concrete world of experience, poses problems for children and, by extension, we can add, foreign learners. Halliday (1985, p. 95) cites an example from his child, Nigel, who had told his mother a long story about a double-decker bus. Nigel's mother says, "Those are very interesting **observations**", to which Nigel retorts: "What did she mean by **observations**?—there are no double decker observation coaches". Martin, Wignell, Eggins, and Rothery (1988) go so far as to refer to this highly nominalised register as "secret English" because of its inaccessibility to many children when they are confronted with it in the educational system.

What then are the pedagogical implications of the research reported in this paper concerning signalling nouns in academic spoken and written texts? The wide range and frequency of these items and their important role in signalling the unfolding of a discourse establishes signalling nouns as important for learners to be aware of and to master. Communication is likely to break down if learners fail to recognise a relation in listening or reading or fail to realise an anticipation which they set up in speaking or writing. A set of grammatical statements derived from the results section of this paper provides a solid framework for developing materials to teach the language of lexical signalling in discourse, whether receptively or productively.

Given the important discourse role that lexical signalling items fulfill, an appropriate pedagogy should involve the study of signals in context. Rules and examples might provide a useful initial heuristic. But this would need to be supplemented with the study and production of signals in context. Alternatively, an inductive strategy might be preferred, with learners identifying signals and how they function in context and then being presented with the rules for reinforcement and systematisation.

Francis (1988) has reported the use of the following approach to the teaching of retrospective signals. Four types of activity were tried:

(1)
- The students were given short texts in which signals were used effectively.
- The students were asked to identify the referents for the signals.
- Students discussed the function of evaluative modifiers to the signals.
- Students were asked what the effect would be if signals were replaced by "this" (the reference would be ambiguous or less precise).

(2)
- Signals were deleted and students asked to select an appropriate one from a given list.

(3)
- The signal was again omitted but this time without alternatives provided.

(4)

- Students were given the first part of a text in which the writer had used a signal and the students were required to provide a follow-up sentence or sentences.

All of these activities might be modified to take account of the in-clause and exophoric realizations of signalling nouns, not dealt with by Francis.

An alternative approach might be for learners to mirror the process underlying the corpus-based empirical dimension of the research presented in this paper. That is to say, learners would use a concordancer to work out the forms and functions of signalling nouns. Authentic examples derived from the concordancer have the potential to show learners the catophoric, anaphoric and exophoric functions of signalling nouns. Unsorted authentic concordances (i.e. sets of concordances which have not had non-signalling homographs removed) can be used to illustrate how there is not a one to one relation between a lexical item and its signalling function, i.e. items which look like signalling items may in fact have another function (like the word **fact** in this sentence, in **fact!**). Information concerning the typical patterns in which given signalling items occur can be used to show learners how to recognise if a given item is fulfilling a signalling function or not.

Students can access the sort of linguistic information referred to in the previous paragraph either directly from the computer—i.e. they can be trained to look for signalling items and run the concordancer themselves—or via hard copy print-outs; most concordancing software allows data to be exported to word-processors; it can thus be edited and incorporated into printed materials (see Thurstun & Candlin, 1998 for material along these lines which includes signalling nouns, although does not focus on them specifically).

To conclude with a word of warning; there is a danger in any applied linguistic research of attaching incommensurate pedagogical importance to a new insight or finding. While this paper has focussed on signalling nouns, it should be stressed that this is but one type of textual cohesion. The sort of pedagogic materials envisioned here would thus perhaps be seen as part of a battery of exercise types on cohesion (e.g. Nuttall, 1983 for exercises to develop other aspects of cohesion). Furthermore, it should be noted that the types of relations which signalling nouns are used to express are not always marked lexically (Winter, 1977), as illustrated in the following examples (30) and (31). Learners need to be made aware of this fact also.

30. Muscle fibres are not the only cells capable of movement. Certain white blood cells can undergo amoeboid movement by streaming of the cytoplasm... (exemplification)

31. When a eukaryotic cell divides the chromosomes replicate and are distributed evenly between the new cells by means of an elaborate spindle apparatus made of microtubules. When a prokaryotic cell divides the DNA replicates and the two strands move into the new cells without the aid of a spindle apparatus. (contrast)

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