A comparison of Thematic options in novice and expert research writing

Ann Montemayor-Borsinger
Instituto Balseiro (CNEA-UNC)

This work compares sentence-initial choices in research papers made by writers with different levels of expertise. To this effect it contrasts the draft of a paper written by a doctoral student in physics, and the published version of the same paper rewritten by an expert physicist. The method of analysis is based on a systemic-functional formulation of Theme taken from Halliday (1985,1994), but which includes grammatical Subject as an obligatory element.Within this modified approach, Theme is divided into an optional Contextual Frame that marks Theme, and an obligatory grammatical Subject (Davies 1988,1997). The analysis shows that the expert makes more effective sentence-initial choices than the novice by making full use of the options offered by Contextual Frames and Subjects to serve epistemic and interpersonal functions.

Key words: research writing expertise, thematic options, epistemic Subjects, interpersonal functions.
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Ann Montemayor-Borsinger
Instituto Balseiro (CNEA-UNC)
8400 S.C. de Bariloche
Río Negro, Argentina
correo electrónico:borsinga@cab.cnea.gov.a

En este trabajo se comparan opciones temáticas hechas por físicos con diferentes niveles de experiencia en la escritura de artículos de investigación. A tal efecto se contrasta el borrador de un artículo escrito por un doctorando, y la versión publicada del mismo artículo escrita por un investigador experimentado. El método de análisis se basa en un enfoque sistémico-funcional de Tema tomado del trabajo de Halliday (1985, 1994), pero que incluye el sujeto gramatical como elemento obligatorio. En esta variante el Tema se divide en un Marco Contextual optativo y en un Sujeto gramatical obligatorio (Davies 1988,1997). El análisis muestra que el investigador experimentado hace elecciones temáticas más efectivas que el doctorando al hacer pleno uso de las opciones ofrecidas por el Marco Contextual y Sujeto para desarrollar funciones epistémicas e interpersonales.

1. Introduction

Halliday's seminal approach of viewing language as a systemic resource for creating meaning has influenced many studies of academic written discourse. More specifically, growing interest in the writing of research articles in the sciences has promoted different types of analyses. Some have focused on generic characteristics, from general studies such as Swales (1990), to more particular ones such as Davies (1997), Thetela (1997), Hyland (1998) and Swales et al (1998) to mention only four recent ones. Others such as Gosden (1996) have centered on successful instances of such texts.

This study focuses on the different choices made by novice and expert physicists when writing a paper, in what is sometimes seen to be a very restricted genre. It compares the linguistic choices made in Thematic structure of a draft written by a doctoral student, and the published version written by an expert.

The approach used for analyzing the differences between novice and expert writing is the systemic-functional one associated with the Hallidayan school. This approach considers the clause as made up by a combination of three strands of meaning, Textual meanings that organize the clause as a message, Interpersonal meanings that set up the clause as an exchange between speaker and listener, and Experiential meanings that set up the clause for modeling experience. Systemic functional linguistics sees these combinations of meanings as being not only characteristic of the clause, but also as running through the whole of language. Within this approach, when we want to explore more particularly how the clause is organized as a message we have to examine the system of Theme, i.e. 'the element which serves as the point of departure of the message' (Halliday 1994:37). The present method of analysis is based on Halliday's formulation of Theme, but includes grammatical Subject as an obligatory element (Davies 1988, Berry 1995, Gosden 1993). The analysis is based on Theme choice because in scientific research articles it appears that 'as part of a writer's available linguistic resources, the choice of first position in the sentence is significant' (Gosden 1993:57).

To capture this system of choice a comparative analysis is made of the two texts, which describe and comment an experiment in superconductivity. The texts will hereafter be called TEXT 1 – the draft written by the doctoral student, and TEXT 2 – the final version revised by the head of a superconductivity laboratory and published in *Physical Review Letters*.

The following section presents the method to be used in the analysis of the two texts. Section Three discusses the findings. Section Four shows that by analyzing the Interpersonal elements present in Theme valuable insights can be gained on the interplay between the Interpersonal, Experiential and Textual meanings present in language.

2. Method of analysis

2.1 Definition of Theme

Within systemics there are different positions regarding the extent of Theme. For Halliday the Theme is the point of departure of the message. He accounts for multiple Themes which can have simultaneously Textual, Interpersonal and Experiential elements. The Textual and Interpersonal elements are optional, but there always has to be an Experiential element in the Theme. Thus for Halliday 'multiple Theme' extends up to and includes the first Experiential element.

The analysis of the present study, following Davies (1988,1997), includes the grammatical Subject as an obligatory element in Theme. In a similar way Berry includes in Theme 'everything that anyone working in the Hallidayan tradition has ever... advocated including' (1995:64) and treats as Theme 'everything that precedes the verb of the main clause' (ibid.). It is suggested that these extensions to Halliday's Theme give it more pedagogic potential and is closer to what we feel Theme should be, perhaps because 'Subject is equated with the intuitive notion of "what the clause is about"' (Davies 1988:177). Davies thus postulates two, rather than one potential functions for Theme. These are 'identification of [obligatory] *Topic*, realized by Subject, and provision of [optional] *Contextual Frame*, realized by elements preceding Subject' (Davies 1997:55, italics as in the original, text in brackets added). In the present study I use the label 'Subject' rather than 'Topic', as in the present corpus of physics research papers Topic is indeed realized by Subject. The study analyses Theme only in main clauses to give a clearer picture of significant thematic patterns without the interference of secondary organization.

2.2 Taxonomy of Theme components used in this study

When the Subject of a sentence is conflated with Theme it is treated as unmarked. Both Davies (1988, 1997) and Gosden (1993, 1996) have extensively discussed grammatical Subject functioning as unmarked Theme in academic writing. As grammatical Subject functions as topical element, it is a recurrent element in discourse. This 'repeated occurrence... of the same topical element... as Subject is seen not only to specify Topic, but also to be the primary means by which the continuity of coherent [academic] discourse is achieved.' (Davies, 1988:177, my brackets).

Optionally the Subject of a sentence can be preceded by a Contextual Frame, whose function is to help 'the development of Topic as the discourse proceeds…'(Davies 1997:55). An illustration of unmarked and marked Theme is shown below with examples from the present corpus; Example 2 shows in particular how the optional element of Contextual Frame marks Theme.

Example 1: Unmarked Theme

The critical current	*was defined by a 20 nV/mm criterion.*
SUBJECT UNMARKED THEME	

Example 2: Marked Theme

In all cases	*the samples*	*were decorated at 4.1 K after the current was switched off.*
CONTEXTUAL FRAME	SUBJECT	
MARKED THEME		

2.3 Discourse functions of Subject

The Subject analysis is based on a taxonomy of four different classes: the Participant, Discourse, Conventional and Instantial classes. The Participant and Discourse classes, taken from Davies (1988) and Gosden (1993) are easier to distinguish by means of general linguistic criteria and, in particular, they belong to fairly well defined lexical sets. These are presented first. Then, the two Conventional and Instantial classes set up in Montemayor-Borsinger (2002) will be discussed.

- The **Participant Class** is realized in the present corpus by the pronoun *We…*, where authors openly appear in the text.
- The **Discourse Class** is realized by elements such as *This paper…* and *Section...* These elements focus on the text and its parts and on the discourse acts of reporting and discussing.
- **The Conventional Class.** The Conventional class is realized by elements, mostly of a taxonomising type, that refer to entities and events belonging to experiments and theory within the realm of physics. These elements belong to the specialized language that is commonly used in science. In contrast with the other classes of Subjects, the Conventional class does not contain interpersonal elements.

In the Conventional class, Subjects are realized by nouns on their own such as *vortex…*, *currents…*, *defects…* or nouns or 'of-type' nominal groups which may be optionally modified in the following ways:

- optional pre-modification by items such as deictics, numeratives and classifiers e.g. *this jump…*, *the Flux Line Lattice…*, *the transport current…*

- optional pre-modification by adjectives describing an objective property of the phenomenon in question e.g. *a finite current…*, *the magnetic decoration…*
- absence of postmodification except 'of-type' nominal groups. Following Sinclair (1991) 'of-type' nominal groups are not seen as introducing prepositional phrases which function as qualifiers, but rather as introducing a second noun as a potential headword, or as forming double-headed nominal groups. For instance, when meanings are expressed with double-headed nominal groups, neither noun seems to be more significant or dominant, and to express these meanings the *'of'* structure tends to require both nouns. Examples are *the structure of the vortex lattice…*, *the density of defects…*

- **The Instantial Class**. The term 'instantial' was inspired by Halliday (1998). It is used here in his sense of wordings especially created for the immediate requirements of reasoning within a particular stretch of discourse, and shares some of the 'epistemic' characteristics distinguished by MacDonald (1992). In a similar way to Conventional Subjects, Instantial Subjects are realized by elements that refer to entities and events belonging to experiments and theory within a given research field. However, the difference is that these Subjects have been especially formulated to create new combinations of meanings.

These more highly crafted elements are needed, for instance, to 'package' information in resourceful and innovative ways in the Subject slot. To package information and express new wordings, the researcher may need to form complex nominal groups containing embedded clauses and phrases such as in *The analysis of samples prepared that way…* or *The analysis of a large number of pictures of the type shown in Fig. 1…* Instantial Subjects are also used for issues that may not yet be established, and may be concernPed with interpretation or controversy, in which case authors resort both to modification and to interpersonal elements. Examples are *Neither the density of free Flux Line Lattice defects of the equilibrium configuration or the critical current…* and *The best available data from small angle neutron scattering...* Alternatively, Instantial Subjects are used by writers once they have absorbed and made their own the substance with which they are working. In all these cases there is authorial presence, either because authors have modified Subjects in such an extensive way that they no longer belong to the purely taxonomic jargon of their area of research, or because authors have introduced interpersonal elements within the Subject slot. The Instantial Class allows authors to treat theories, hypotheses, models and categories as objective entities by putting them in Subject role, although they know such entities have a hypothetical status. In contrast, we saw above that Conventional Subjects identify elements that are taken for granted and which are already established. They are commonly used terms which have not been specially created, but rather belong to the taxonomic system or specialized language of the research field concerned.

The discourse functions of the four Subject Classes are summed up in Table 1:

Table 1

Subject Class	Discourse Function	Example
Participant	Place writers themselves in subject position as visible participants in the reporting process	*We...*
Discourse	Present writers' aims and intents in subject position by items of the discourse itself	*This section...*
Conventional	Place in subject position commonly used terms from the research field concerned	*the Flux Line Lattice...*
Instantial	Place in subject position highly crafted elements that package information and express complex ideas and processes	*Neither the density of free Flux Line Lattice defects of the equilibrium configuration or the critical current...*

2.4 Discourse functions of Contextual Frame

Davies has worked in detail on marked Theme and Contextual Frame. In her words, 'Unlike topical elements which are the recurring elements of coherent discourse, these framing elements are typically non-recurrent and as such signal changes/shifts or stages in the progression of the discourse'(1997:55). She adopts a categorization which 'allows for the inclusion, as examples of marked, and (multiple) Theme, of elements which are not identified as such by Halliday, that is, the class of "minimal" adjuncts represented by conjunctive and modal adjuncts and conjunctions and, in addition, *a small set of thematic Subjects which are seen to be marked in their semantic role* in that they do not identify participants, ..., but instead, appear to "frame" the message by specifying discourse goals or projecting evaluation. '(1997:56, stress as in the original text).

Davies has four categories of discourse functions for Contextual Frame:

- **Location**: Contextual Frames which are circumstantials of Location. In the present corpus these express mainly meanings of Location in Theory *(In reference* [*9*]*... In this regime...*)
- **Logical Relations/Progression**: Contextual Frames which express meanings related to comparison *{as in...*), addition (*furthermore..., in addition to..., and...),* contrast *{however..., or..., but..., on the other hand...),* condition *(when..., if...),* concession *(although..., despite..., in spite of...),* and consequence *(as a result..., thus..., as a consequence..., then...)*

- Goal and Process: Contextual Frames which express author intent expressions such as *In order to estimate the time scale of the defect relaxation process induced by the Lorentzforce...* and *To study samples without grain boundaries...*
- Evaluation: Contextual Frames where authors choose to comment or appeal to the reader. In the present type of analysis Evaluation Contextual Frames can further be defined as those parts of the clause which come before the main Subject and which reveal the attitude of the researcher vis-à-vis his work. Typical examples are expressions such as *it is important to remark that...* or *it is clear that...* where the author makes comments in expressions that 'frame' the main Subject of the clause complex.

The discourse functions of the four Contextual Frame classes are summarized in the following :

Table 2

Contextual Frame Class	Discourse Function	Example
Location	Locate what is being done within theories, experiments, etc.	In this regime...
Logical Relations/Progression	Link what is being done to previous text	Thus...
Goal and Process	Establish writer intent	To study samples without grain boundaries...
Evaluation	Establish writer stance	This is good evidence that...

3. Findings

3.1 General comments on the two texts

This section analyses the two texts. TEXT 1 is the draft of a paper that was written by a doctoral student in Physics, working on superconductivity in a laboratory in Argentina. As shown below, the draft, TEXT 1, has a few more words, slightly longer sentences, and less marked Themes than TEXT 2. TEXT 2 is the published version in *Physical Review Letters* which was rewritten by an experienced physicist working on the experiment in a laboratory in the United States. The two texts were selected on the basis of interviews with scientists and the doctoral student who sent the draft to the experienced physicist. The main criterion for selection was comparability, the two texts being written-up versions of exactly the same experiment. The comparative analysis seeks to study the choices

made by two authors with differing levels of expertise in physics (the novice who wrote TEXT 1 and the expert who wrote TEXT 2) and in English (the novice being a non-native speaker and the expert a native-speaker).

DRAFT: TEXT 1	PUBLISHED VERSION: TEXT 2
2,879 words	2,666 words
116 Themes	120 Themes
40 Marked Themes	47 Marked Themes

3.2 Comparative analysis of Subject

Table 3 shows that most of the Subjects of TEXT 1 and TEXT 2 are from the **Conventional** Class, 70% for TEXT 1 and 73% for TEXT 2, a class devoid of interpersonal elements. A 'quick and dirty' conclusion would be to say that TEXT 1 written by the novice is a marginally more interpersonal text.

Table 3. Distribution of subject

SUBJECT CLASSES	TEXT 1	TEXT 2
Participant	6%	11%
Discourse	21%	7%
Conventional	70%	73%
Instantial	3%	9%
TOTAL	100%	100%

However, a more delicate analysis shows that this is not the case. If we examine the first two classes, the expert in TEXT 2 prefers to choose his Subjects in the **Participant** Class (11% focus on *we*) rather than in the **Discourse** Class (7%). By contrast, the author of TEXT 1 anchors his Subjects heavily in the **Discourse** Class, with 21% of his Subjects focusing mainly on the products of the research (results and figures). He chooses the *we* of the **Participant** Class in only 6% of the cases.

If we now examine the more 'discreetly' interpersonal Subjects within the **Instantial** Class, we can observe that TEXT 2 by the expert has three times as many as TEXT 1. We saw above that the **Instantial** Class allows authors to *treat* theories, hypotheses, models and categories as objective entities by putting them in Subject role, although they know such entities have a hypothetical status. By presenting elements of their work

as objective *and* abstract entities within the **Instantial** Class authors give these elements another status within the scientific arena. It is this capacity of anchoring their work within an abstract world shared by the profession which, I suggest, opens in part the gates of 'expertness' to novices. In other words, an expert will be able to craft some of his Subjects in such a way that his personal evaluation appears embedded within the paradigms of his research community. This capacity is particularly important in view of the fact that in research papers ' …evaluation, while being personal, is also dependent upon the value-system of the community in which the text is produced.' (Hunston 1994:210).

Moreover, if we now turn to Table 4 which shows a few examples of Subject wordings within the **Instantial** Class, the differences between TEXT 1 and TEXT 2 appear to be not only quantitative, but also qualitative. The expert scientist in TEXT 2 uses a wider range of **Instantial** Subjects, and makes full use of the complex choices offered by this class. For instance, the expert is able to construct the highly epistemic and rhetorical Subject *the type of defects formed, how they evolve with increasing current and how their number and type are related to the magnitude of the critical current and sample history (are still open questions)*; the choices he makes within the **Instantial** Class also involve what Thetela (1997) has coined Research-Oriented Evaluation, examples being *A careful look at the data…, The distinction between the two types of defect (is difficult)…*, and cataphoric-type Subjects such as *it* in the sentence *It is notoriously hard to deduce real space defect structures from reciprocal space images*, where it projects towards the expression *to deduce real space defect structures*.

Of the **Instantial** Subjects chosen by the novice in TEXT 1, there are also Empty Subjects *it* but, in direct contrast to the choices made by the expert, embedded in rather candid sentences such as *Thus it is not clear which is the type of defects…* Others involve the choice of a post-modified abstract entity, *The Fourier transform of the vortex structure in tilted fields*; however, here again the novice has been unable to exploit the possibilities offered by the **Instantial** Class of aptly influencing readers.

3.3 Comparative analysis of Contextual Frame

Table 5 shows that the use of **Location** and **Goal and Process** Contextual Frames is similar in the two papers, and I shall thus not comment further on them, but rather concentrate on **Logical Relations/Progression** and **Evaluation** Contextual Frames where differences are comparatively greater. In particular, Table 5 shows that **Evaluation**[1] is where the most significant difference lies, TEXT 2 having three times as many such Contextual Frames as TEXT 1.

[1] **Evaluation** Contextual Frames in both texts are sometimes preceded by **Logical Relations/Progression** Contextual Frames and in one case by a **Location** Contextual Frame. To simplify the classification, **Evaluation** Contextual Frames preceded by **Logical Relations/Progression** Contextual Frames of Concession went under the **Logical Relations/Progression** heading in the statistics of Table 5, because these tended to be more concessive than evaluative. The other complex Contextual Frames went under the heading of **Evaluation** because evaluation was their main component.

Table 4. Examples of wordings of Subjects within the Instantial Class in TEXT land TEXT 2.

Instantial Subjects TEXT 1	Instantial Subjects TEXT 2
it (is not clear which is the type of defects...)	... the type of defects formed, how they evolve with increasing current and how their number and type are related to the magnitude of the critical current and sample history (are still open questions)
The Fourier transform of the vortex structure in tilted fields (is anisotropic...)	The best available data from Small Angle Neutron Scattering (is consistent with ...)
	It (is notoriously hard to deduce real space defect structures from ...)
	A careful look at the data (shows ...)
	The distinction between the two types of defect (is difficult...)

Table 5. Distribution of Contextual Frames

Contextual frame classes	TEXT 1	TEXT 2
Location	20%	21%
Logical Relations/ Progression	55%	47%
Goal and Process	20%	17%
Evaluation	5%	15%
TOTAL	100%	100%

Here again the difference is not only quantitative, but also qualitative. Table 5 permits a more delicate analysis of **Evaluation** by presenting the actual wordings of this set of Contextual Frames in both texts. The table shows that the type of Evaluation the novice author in TEXT 1 uses is both prudent (first three Contextual Frames of Evaluation + **Concession**)[2] and established (last two Contextual Frames *it is important*, *it is surprising)*. The expert in TEXT 2, in his only Evaluation + **Concession**, is bolder e.g. the use of the expression *fundamental characteristic.* He is also able to use a wider range of expressions such as *theoretically it has been suggested that*, *this is consistent with, as would be expectedfrom what we have argued above* together with more established expressions such as *it is clear that.*

Table 6. Wordings of the Contextual Frames in TEXT 1 and TEXT 2 containing **Evaluation** - see footnote 2 on how the statistics in Table 5 were arrived at.

Evaluation Contextual Frames TEXT 1	Evaluation Contextual Frames TEXT 2
Concession + Evaluation: *Although the subject is of technological relevance and has been studied to conventionaland high temperature superconductors for many years..*	**Concession + Evaluation:** *Despite the fact that this mechanism of depinning is related to the most fundamental characteristic of a superconductor, namely its ability to carry a current without.loss*
Concession + Evaluation: *Despite this qualitative difference between the starting states at zero current*	**Evaluation:** *Theoretically, it has been suggested that*
Concession + Evaluation: *In spite of this and theoretical results supporting that die disorder induced by pinning should be suppressed when the average velocity of the* VS *is high enough*	**Evaluation:** *The main point of this paper.is that*
Location + Evaluation: *Before closing the discussion of the results of the decoration technique it is important to remark that*	**Consequence + Evaluation:** *Given that there are six sharp peaks, it is clear that...*
Evaluation: *It is then surprisingthat in this uncorrelated force regime*	**Evaluation:** *This is good evidence.that*
	Evaluation: *This is consistent with theoretical end experimental results which indicate that in this regime*
	Evaluation: *This suggests that*
	Contrast + Evaluation: *On the other hand,* **as** *would be expected from what we have argued above*
	Evaluation: *An unresolved issue is why...*

[2] When the Contextual Frames are complex ones, such as Evaluation + **Concession,** the word marked in bold indicates the heading under which the Contextual Frame was classified for the statistics in Table 5.

If we now turn to **Logical Relations/Progression** Contextual Frames the overall difference in percentage is not remarkable, i.e. 55 % and 47 % for TEXT 1 and TEXT 2 respectively. However, if we once again make a more delicate analysis of the type of **Logical Relations/ Progression** involved, as shown in Table 7, notable differences emerge.

Table 7. Detailed distinction of the **Logical Relations/Progression** Contextual Frames

Logical Relations/Progression Addition	2.5%	4%
Logical Relations/Progression Concession + Evaluation	10%	2%
Logical Relations/Progression Consequence	22.5%	9%
Logical Relations/Progression Contrast	12.5%	6%
Logical Relations/Progression Condition	7.5%	15%
Logical Relations/Progression Comparison	0	11%
TOTAL Logical Relations/Progression	55%	47%

We have already commented on **Logical Relations/Progression** Contextual Frames of Concession in **Evaluation**, because they partly evaluate, but even there we saw a difference between TEXT 1 by the novice and TEXT 2 by the expert, the latter being bolder in the part of the clause where he makes a statement, i.e. *the most fundamental characteristic of a superconductor*... Now we also see that TEXT 2 resorts far less to concession than TEXT 1. TEXT 1 in **Logical Relations/Progression** Contextual Frames uses mainly Concession, Consequence and Contrast and no comparison whatsoever, whereas the expert in TEXT 2 uses mainly Condition and Comparison, the comparisons being systematically made with previous successful results published by the same research group.

4. Conclusions

If we now look at the different choices observed in TEXT 1 and TEXT 2 in the light of Halliday's three metafunctions, the Experiential, which is the representation of physical experience, is an obvious concern for scientists writing up their research articles. But just as important is the Interpersonal, the way scientists represent and negotiate discourse as an exchange between themselves and their readers, and the Textual, the way they organize and structure their writing as a cohesive sequence. By making a more delicate analysis of Theme, especially of **Instantial** Subjects, **Evaluation** Contextual Frames and **Logical Relations/Progression** Contextual Frames, we can see that choices affect not only the Textual metafunction, or the Experiential element within the Textual, but also, and significantly, the Interpersonal within the Textual. Regarding the latter, an important difference between novice and expert writing is that the expert appears more openly in the text in Subject, either by overtly using *we* or more subtly by commenting and evaluating and making full use of the **Instantial** Class, which offers the possibility of influencing readers, mostly without appearing to do so.

When Theme is marked the main difference is again that the experienced scientist uses Interpersonal elements within **Evaluation** Contextual Frames to lead the reader into accepting the relevance and validity of the experiments which are being presented. We also saw that another difference lies in the way the two authors use **Logical Relations/ Progression** Contextual Frames. Where the novice is on the defensive, and relies on contrast and consequence to give significance to his results, as well as on concession to try and prevent criticism, the expert uses condition to push arguments forward, and comparison with previous successful results made by the same laboratory to demonstrate the relevance of their work.

With pedagogical applications in mind, the present analysis illustrates the need for informing novice researchers on the importance of Interpersonal elements within Theme. An awareness of the way these elements influence readers can become a powerful means of communicating results more efficiently. By analyzing expert writing, novices can build up, as they publish successive research articles, a style more tailored to their needs. Whatever the initial choices are, these should be taken not as an immutable blueprint that ought to be followed forever, but as possible options of how results can be presented and as a basis upon which more personal ways of writing can be explored and more strategic choices can be made.

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