5. From Information Transfer to Data Commentary

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Information Transfer (IT) uses non-verbal material (graphs, charts, etc.) as either prompts for writing or as tasks for students to complete by gleaning information from written text. Despite the apparent methodological effectiveness of an IT task, in reality people do not simply transfer information from one format into another. In particular, a piece of writing accompanying non-verbal material typically takes the form of a selective and interpretive commentary. The purpose of this paper is to discuss how we can use the results of discourse analysis to guide our students beyond the simple transformation of information towards the more pragmatic and challenging task of writing a commentary on the non-verbal data. The writer must decide what if any parts of the non-verbal data should be repeated (information transfer) and how the data should be interpreted.

Introduction

A brief history of Information Transfer

Right from the early days of English for Specific Purposes (ESP), the use and value of incorporating technical non-verbal material in teaching texts and tasks was widely recognized (e.g. Herbert, 1965). By the middle 1970s the exploitation of formulas, diagrams, graphs, and tables had become a major feature of materials, especially in English for Science and Technology (EST), and at about this same time this interplay between verbal and nonverbal material became conceptualized within the field under the banner of "Information Transfer." As far as we are aware, "Information Transfer" (henceforth IT) was first introduced by Henry Widdowson in a paper presented at a 1973 seminar of the British Association of Applied Linguistics. The concept then found its first articulation in textbooks, appearing in Allen and Widdowson's opening volume to the *Focus* series in 1974. Widdowson himself was very much the leader in this development, and he incorporated discussion of IT in several influential EST papers that he wrote about this same time (collected in Widdowson, 1979).

Widdowson argued that non-verbal information was part of the universal language of science which non-native speakers (NNS) had access to in their

native language. Hence, students in the physical sciences would likely understand a simple formula like:

$$S + O_2 \rightarrow SO_2$$
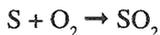
even if they might not be able to articulate their understanding in an appropriate English utterance such as:

Sulfur combines with oxygen to produce sulfur dioxide.

In his pioneering 1973 paper, Widdowson defines IT as transferring information from one mode to another, and then provides the following explanation:

Transferring information from a verbal to a non-verbal mode is an exercise in comprehension. Transferring from a non-verbal to a verbal is an exercise in composition. This suggests that information transfer can serve as a transition between receptive and productive abilities in handling written language. Once the learner is practiced in the completing and drawing of diagrams, tables, graphs, and so on based on verbally expressed information, these non-verbal devices may be used as prompts for verbal accounts. Thus, for example, one might present a verbal description of a chemical experiment and require the learner to label a diagram or draw a diagram of his [sic] own which expressed the same information. A diagram showing a similar experiment might then be presented and the learner required to produce a verbal description, which would to some degree match that of the original descriptive passage. (reprinted 1979:73)

Expressed in this way, the *methodological* power and appeal of IT is undeniable, and it is not surprising that it rapidly became part of the mainstream ESP/EST pedagogical activity. For example, IT is a core element in both the *Nucleus* (c.f. Bates, 1976) and the *Focus* series; it also continued to be discussed and refined in the professional literature. For instance, Bartolić (1981) takes the reader from a diagram of a heating plant, through a step-by-step verbalization, to the production of a final *summary*. Johns and Davies (1983), add "jigsaw" type elements to IT, whereby students need to extract inform-

ation from two texts to complete a diagram. The advantages of "mode-transfer" were also apparent to those in test development for English for Academic Purposes (EAP) and ESP, as witnessed by the use of non-verbal material on earlier forms of TOEFL's Test of Written English.

However, despite its methodological attractiveness, the concept of IT has limitations, even if it seems that the ESP community has tended to underplay them. Thus, the purpose of this paper is to both discuss those limitations as well as to suggest an alternative approach to exploiting non-verbal material in ESP classes. But first, we need to comment briefly on some changes in the recent ESP landscape.

Changing Concepts of Technical Cultures

The last decade in EAP has been an exciting one as practitioners have become more connected to the work of other scholars. These connections have had a number of consequences for the way we think about academic and scientific language. First, the revival of interest in contrastive rhetoric, particularly as it pertained to studies of professional genres such as the research article, shows more cross-cultural variation in practice than might have been supposed. Scholars such as Hinds (1987) have shown that certain Asian cultures may with-hold "obvious" information from readers as a sign of respect for them. As we and our institute colleagues have seen in their oral presentations, Asian students often refrain from commenting on their visual aids, assuming that the audience can see for itself what the visual implies. This suggests that straightforward verbalization of non-verbal material may be more acceptable in some academic cultures than in others. Hence, a simple notion of "a universal language of science" is probably not entirely appropriate. Moreover, the reasons for this variation appear to be quite diverse, involving social, institutional, as well as rhetorical factors.

A second development has been the "social constructionist" movement and its belief that scientific facts are not "out there" to be collected, but are con-structed via the consensus of particular communities. And here the work of Greg Myers (1990a) on biology and Charles Bazerman (1988) on physics has been particularly influential. Thus, we now see that scientific and academic rhetoric is determined by disciplinary traditions and conventions. More recently, studies by Barton and Barton (1993) and others have argued that the non-verbal materials themselves can incorporate assumptions, conventions,

and goals of the individual, group, or society that have created them; thus, they may not necessarily be a simple reflection of reality - and perhaps deliberately so. A case in point is the famous and highly successful map of the London Underground, where they show that its ease of use is precisely due to the fact that is not a realistic map of where the subway lines actually go.

A third development has been a move to cater to the ESP needs of more advanced students (such as graduate students) and professionals, such as NNSs wanting to publish in English. This trend has a number of causes that we need not investigate here, but is clearly manifest in the kinds of articles published in the *English for Specific Purposes Journal* over the last decade. If we add to these three factors, the fact that writing about non-verbal material in the *real world*, even in textbooks, typically involves something more or something other than straight information transfer, then we can see that the methodological advantage of IT is likely offset by its apparent rhetorical simplicity and inappropriateness of its typical products in terms of "real world" writing. Why, after all, say the same thing twice - once in words and once in non-verbal form?

As a response to these factors, we argue that a piece of writing designed to accompany non-verbal material typically takes the form of a selective and interpretive commentary (Swales and Feak, 1994). Thus, the writer is faced with a range of rhetorical and strategic decisions that involve such questions as:

- What is my target audience, and how does this audience influence my decisions?

- Where, if at all, do I need to refer the reader to the location of the non-verbal content?

- Which results should be highlighted, and for what reasons?

- What conclusions or implications can be drawn from the data - and how should they be qualified (or hedged)?

- Do I need to bring in a broader context, critique the methodology, and/or compare the results with others?

The move from IT to interpretation accords well with what scholars have dis-

covered about more mature and successful writers. For Flower, writing about data would involve "going beyond reception and understanding..." The successful writer is able to " ...turn facts into concepts, turn concepts into policy or a plan, and see the issue and define the problem within a problematic situation" (1990:5). In short, writing a data commentary requires critical literacy skills.

Critical and selective commentary can also be seen as a reinforcement of *knowledge-transforming* as opposed to *knowledge-telling* (Bereiter and Scardamalia, 1987). According to Cumming (1995), knowledge transformation in writing,

> develops relatively independently of people's proficiency in a second language, but nonetheless exerts a crucial influence on how well they are able to write in a second language... An important implication for ESL [or even EFL] instruction in academic [writing] is that students who have not yet developed a knowledge trans-forming approach to composing may have to be prompted to do so through instructional approaches aimed specifically at this goal. (p. 378-379)

Overall, then, we believe that beyond the elementary levels, the traditional concept of IT should be embraced within a wider concept of data commentary, in which a proactive and critical approach to "reading" the data is encouraged, and in which the written output provides an opportunity to demonstrate intelligence, analysis, and that elusive characteristic of "interestingness." But before we discuss our detailed proposals for how this might be achieved, we would like to demonstrate the need for this kind of EAP work by examining data commentaries produced by four NNS students on entry to graduate programs at a large U.S. university.

Four Data Commentaries

The University of Michigan, like many Anglophone universities around the world, re-evaluates the English ability of most new international graduate students. For the writing part of the re-evaluation, two tasks are required: one a 30-minute composition based on source material and the other a data commentary. For the 1993-94 commentary, the students were instructed to

imagine themselves as part of a research team investigating aggression in 8-year old children. The students were presented with a set of data that they had "collected" (see table 1) and the hypothesis that 8-year old boys are more aggressive than 8-year old girls. They were then given 15 minutes to write a commentary, for which the first sentence was provided:

> In order to investigate the hypothesis that 8-year old boys are more aggressive than 8-year old girls, 8-year old children were observed playing in schoolyards and incidents of certain aggressive behaviors were recorded.

Commentaries are scored holistically and assigned a rating ranging from a low of 63 to a high of 97.[1]

Table 1. Percentage of girls and boys displaying aggressive behavior

Aggressive behavior	Girls	Boys
Pushing	21%	35%
Kicking/Hitting	15%	61%
Cursing	9%	30%
Chasing	78%	1%

We have selected the work of four new graduate students, Tetsu, Juan, Alex, and Marc[2] to represent the range of approaches to the task. The texts appear in their original form, including grammatical and lexical errors; however, since these are minor they do not detract from the types of statements made. Sentence numbers have been added for ease of discussion. The rating for each of the commentaries follows in parenthesis.

The Commentaries
We first present the commentary of Tetsu, who plans to obtain a Master's degree in public policy studies.

Tetsu

[1]In order to investigate the hypothesis that 8-year old boys are more aggressive than 8-year old girls, 8-year old children were observed playing in schoolyards and incidents of certain aggressive behaviors were recorded. [2]Table 1 shows that boys are more aggressive than girls. [3]The percentage of pushing is 21% of girl; on the other hand that of boys is 35%. [4]Except for chasing, the percentage of aggressive behavior is higher in boys. [5]From this data you can agree that boys are more aggressive than girls. (Rating: 73)

Tetsu expanded on the sentence prompt, adding four sentences totaling 51 words. In sentence 2, he appropriately locates the source of the data; however in the potential discussion of the data in sentences three and four, he simply repeats the contents of the table. Tetsu has highlighted only two aspects of the table: pushing (the first behavior) and chasing (the last behavior). Since the purpose of the research is to determine whether 8-year old boys are more aggressive, it is questionable whether he has chosen the best information to highlight. It would seem that kicking and hitting are of greater significance. This suggests that Tetsu, at least for this task, has difficulty distinguishing the more important facts from the less important ones. Moreover, although Tetsu notes that the chasing percentages are inconsistent with the rest of the data, he does not attempt to explain that this behavior is different in terms of level of aggressiveness. He compares, but does not evaluate. In his concluding sentence, Tetsu seems satisfied that he has discussed the data sufficiently enough to enable the reader to agree with the hypothesis. As is the case with many of our Asian students, he has refrained from much discussion or explanation, assuming that the readers themselves would, of course, reach the same conclusion. In short, we can see from this discussion that Tetsu's approach to the task is one of simple information transfer.

Juan

Juan is beginning his studies in Industrial and Operations Engineering. Although his commentary is slightly more successful than Tetsu's, his approach is also essentially one of IT.

[1]In order to investigate the hypothesis that 8-year old boys are more aggressive than 8-year old girls, 8-year old children were observed playing in schoolyards and incidents of certain aggressive behaviors were recorded. [2]As you can see in table 1 we only considered four human aggressive behaviors in our study. [3]The most common children aggressive conduct are pushing, kicking/hitting, cursing, and chasing. [4]After several weeks of observation in different schools playground we found the percentage that appeared on table 1. [5](See attachment 1) [6]Sixty percent (61%) of the boys like to kick and hit compared to fifteen percent (15%) of the girls. [7]This is more aggressive than chasing. [8]The chasing behavior was the only one girls were more aggressive than boys. (Rating: 77)

Juan produced a longer response: 90 words - seven sentences of original commentary. He includes in sentence two a location element in the form of a linking as-clause and defines what the research considers aggressive behavior to be. In sentence four we see that he has added a time element (after several weeks), and has highlighted two behaviors - kicking/hitting and chasing, both of which seem reasonable. However, as is the case with Tetsu's commentary, his highlighting statements simply repeat the percentages in the table. He notes the exception (chasing), compares it to the other data, but does not suggest how this should be viewed with respect to the given hypothesis. The response seems to "die" at the end as Juan simply mentions the chasing anomaly. However, what has weakened his commentary most, is the lack of explicit connections among his statements. His account lacks textuality.

Alex

Alex, an entering student in Mechanical Engineering and Applied Mechanics, on the other hand, has taken the task much farther than Juan and Tetsu. In fact, his commentary is typical of many good commentaries that we read.

[1]In order to investigate the hypothesis that 8-year old boys are more aggressive than 8-year old girls, 8-year old children were observed playing in schoolyards and incidents of certain aggressive behaviors were recorded. [2]It was assumed that aggressive behavior consisted of the following: i) pushing, ii) kicking and hitting, iii) cursing,

and iv) chasing. [3]As can be seen from the table above, the average 8-year old boy was more aggressive than the 8-year old girls. [4]Chasing was the one behavior that was more pronounced for the girls. [5]This result, however, does not disprove the theory since chasing seems to be a less aggressive behavior than the other behaviors that were tested. [6]The 8-year old boys got more involved with the more aggressive behavior, which is kicking/hitting, much more than the 8-year old girls. (Rating: 93)

Alex's commentary consists of 105 original words - five sentences. As with Juan's commentary, Alex's commentary refers to the table (sentence three) and identifies the behaviors that the study focused on. However, Alex has taken a more thoughtful approach. He qualifies (actually distances himself from) his statement when he says in sentence two, "It was *assumed* that aggressive behavior consisted of the following…" The text contains another instance of qualification in sentence five: " …chasing *seems* to be a less aggressive behavior." Thus, Alex reveals his awareness that discussion of data may sometimes need to be hedged or qualified. There is no repetition of data from the table in the commentary. Alex seems to let the main data speak for itself, but interprets the one piece of information that does not seem to fit (chasing). In other words, unlike Tetsu and Juan, he notes the exception and links his discussion of it to the hypothesis. Alex goes beyond a simple comparison of the two groups, acknowledging in sentences five and six the fact that the behaviors differ in their level of aggressiveness. In these two sentences Alex demonstrates not only his awareness that he should somehow transform the knowledge, but also his ability to do so. He has constructed something new - something that cannot be readily seen from the table. Alex's discussion is an expression of his view of the data, not of attributes intrinsic to the data itself. Although, Alex does not seem to be linguistically more capable than Tetsu and Juan, his strategy and skill in tackling the task has resulted in a more successful commentary. No wonder that he obtained a high score, excluding him from any writing requirement.

Marc
Finally, Marc, a new graduate student in biology, has approached the task in a manner very different from the others and produced a rather exceptional commentary. We actually see very few commentaries such as this and would

not expect students to react in this way, especially given the rubric that they should assume the findings are their own data! We offer Marc's commentary to demonstrate another approach to the task.

[1]In order to investigate the hypothesis that 8-year old boys are more aggressive than 8-year old girls, 8-year old children were observed playing in schoolyards and incidents of certain aggressive behaviors were recorded. [2]At first glance it appears that 8-year old boys exhibit more aggressive behavior than 8-year old girls if all four recorded behaviors are equally weighed. [3]But, this last assertion is false. [4]Since the ability to record will vary with playground size and the number of observers (not to mention the skills of the observers or accounting for children entering or leaving the playground), and that it takes a certain amount of an observer's time to note the behavior, short-lived behaviors such as cursing or pushing could be under-represented. [5]Simply because more can occur during the time an observer notes another behavior. [6]Conversely, long-lived behaviors such as chasing could be over-represented because they occur over a longer period of time and thus allow more latitude for the observer marking the behavior. (Rating: 93)

Marc wrote the most of the three, adding 136 words - six sentences to the given sentence. Marc differs from the other three in that he analyzes and challenges the data from the start as he says in sentence two, "*At first glance it appears...*" We can say that he challenges the task as well. Marc's purpose was apparently not to actually discuss the findings. He neither cites percentages in the table, nor comments on the actual behaviors. Rather his strategy was to expose the limitations in the methodology. From this discussion, it would appear that Marc has had experience working with and writing about data; on the other hand, his high score seems somewhat generous in light of the actual task design. Marc's response actually illustrates a high-risk strategy of critique which has paid off in this case.

We would all likely agree that Marc and Alex have produced more interesting commentaries than Tetsu and Juan. What distinguishes Marc and Alex from the other two is the extent to which they articulate their "attack" on the data. Tetsu and Juan viewed the task as simple information transfer from

one medium to another - we cannot tell what they make or think of the data. Alex went beyond mere repetition, analyzing the data and offering an interpretation. Marc, on the other hand, used the information, synthesized it with his knowledge about how good research is conducted, presented a critique of the methodology, and logically supported his claim that the data does not support the hypothesis.

We can also see how differently the writers packaged their claims. Both Marc and Alex reveal their awareness that claims must be carefully, yet confidently stated. For instance, Marc states, "*At first glance it appears* that 8-year old boys exhibit more aggressive behavior than 8-year old girls . . ." And "behaviors such as cursing or pushing *could be under-represented.*" Juan and Tetsu, in contrast, make no attempt at interpretation or transformation. The closest Juan comes to doing so is when he says, "This is more aggressive than chasing."

Adopting a Critical Approach to Data Commentary

If their commentaries are a reasonable reflection of their critical literacy skills, Alex and Marc will probably fare rather well as they write in their chosen fields. However, we cannot be so optimistic about Tetsu and Juan. Their simple IT strategy, if extrapolated to other contexts, will result in rather flat and unimaginative writing. However, simply telling them to be more analytical may be insufficient. It would seem that the EAP writing instructor must go beyond helping students with syntax, morphology, vocabulary, and typical genre conventions and attempt to reach out to their critical intelligence.

One possibility is to help students see the discourse strategies that other more successful writers have employed in their texts, and to help them discover the thinking processes that preceded the actual writing; in short, we should try to help them understand the cognitive aspects (Cumming, 1995) of successful data commentaries written by others. Alex's commentary provides a successfully safe strategy and Marc a riskily successful strategy.

We can illustrate changes in attitudes to non-verbal data more clearly by comparing Swales (1971) with Swales and Feak (1994). Unit Eleven of the 1971 *Writing Scientific English* (WSE) is entitled "Tables and Graphs." Its main components are making comparisons (X melts at a higher temperature than Y), constructing generalizations (Two elements - oxygen and silicon - provide nearly 75 percent of the weight of the earth's crust), and using linking

as-clauses (As can be seen in the table…) *WSE*'s focus is on statements, not on text. Here is a typical exercise.

Exercise 14 (a) **Complete these statements of contrast, using Table 13.**

1. Rain falls every month in London, whereas in Alexandria…

2. London has six months in a year with an average rainfall of more than 55mm; on the other hand, Alexandria…

3. Alexandria usually has three months without rain, while…

4. Both cities have approximately the same amount of rainfall in January; in March, however,…

5. London rainfall tends to remain fairly constant throughout the year, whereas …

Table 13 Average monthly rainfall in millimeters

	Alexandria	London
January	48mm	47mm
February	24	39
March	11	47
April	3	38
May	2	41
June	0	52
July	0	63
August	0	61
September	1	45
October	6	68
November	33	60
December	56	61

Exercise 14(b) **Write a short passage comparing the rainfall of Alexandria and Tripoli, Libya.** The information for Tripoli can be found under *City A* in Exercise 14 of Unit 3 (page 33).

Notice that in Exercise 14b there is no indication of how the information might be ordered. Note, too, that the actual commentary might vary according to whether the main highlighting statement stresses differences in regularity of rainfall or differences in the annual total. Nor is there any suggestion that the reader might reasonably expect some explanation of the differences, which could include a discussion of latitude or the effect of the Gulf Stream; thus, this exercise would perpetuate the information transfer approach adopted by Testu and Juan. Today we would want our students to offer us a real commentary rather than a series of contrastive points. By 1994, matters were very different, as revealed by *Academic Writing for Graduate Students (AWG)*.

The first noticeable difference between the two chapters is in their titles. Unit Four of *AWG* is called *Data Commentary*, hinting that the focus here will be on evaluation or analysis, not description. This unit presents the structure of a data commentary, the concepts of hedging and qualification, and strategies for dealing with "problem" data. Throughout, the unit stresses the importance of critical thought in the discussion of data, examining how certain types of statements may help or hinder a discussion. While the unit does contain language focus sections, the overall text is of prime importance. An exercise that reflects the goals of the unit is Task Two.

Task Two (adapted from the original)
Look over the following table, read the data commentary that follows, and then answer the questions.
Table 5. Means of PC Virus Infection in U.S. Businesses

Source	Percentage	Source	Percentage
Disks from home	43%	Company, client, or consultant disk	4%
Electronic bulletin board	7%	Other	9%
Sales demonstration disk	6%	Undetermined	29%
Repair or service disk	6%		

¹A computer virus is a program that is specifically and maliciously designed to attack a computer system, destroying data. ²As businesses have become increasingly dependent on computer systems, concern over the potential destructiveness of such viruses has also grown. ³Table 5 shows the most common modes of infection for U.S. businesses. ⁴As can be seen, in the majority of cases, the source of the virus infection can be detected, with disks being brought to the workplace from home being by far the most significant (43%). ⁵However, it is alarming to note that the source of nearly 30% of viruses cannot be determined. ⁶While it may be possible to eliminate home-to-workplace infection by requiring computer users to run antiviral software on diskettes brought from home, businesses are still vulnerable to major data loss, especially from unidentifiable sources of infection.

1. Where does the data commentary actually start?
2. What are the purposes of sentences 1 and 2?
3. Do you consider this commentary a problem-solution text?
4. What are some of the features of this text that make it an example of formal written English?
5. Which sentence contains the author's key point?
6. After Task One we listed five common purposes for data commentaries. In which category does this one fall?
7. The author has chosen only to comment on percentages greater than 10%. Why? Do you think this is enough? If not, what would be a suitable additional sentence?
8. Undetermined sources constitute 29% of the total. In sentence 5, this is expressed as "nearly 30%." What do you think about this and these alternatives:
   a. over one-fourth of viruses
   b. 29% of viruses
   c. as much as 29% of all viruses

This task looks at the actual discourse and provides students an opportunity to think about data commentary before they do any actual writing. Such a task enables students to realize that writing a commentary entails a number of strategic

choices, both in terms of which parts of the data to highlight and how to write about them. A secondary intent of the task was to offer questions that could prompt or guide the students' thinking when they later wrote commentaries of their own. Thinking back on the commentaries of our four students, Alex and Marc already had a critical approach and probably do not need the type of prompting suggested in the task. Tetsu and Juan, on the other hand, could greatly benefit. In addition to this, a discussion of the components of a data commentary would be useful, such as location elements, highlighting statements, and discussion of implications, problems, or exceptions.

Conclusion

For all its methodological attraction and for all its proven capacity to generate comparative statements, Information Transfer is premised upon an *uncritical* and *under-interpretive* verbalization of data presented via some non-verbal means. We have argued that exploiting the methodological advantage may be advantageous for the ESP classroom, but disadvantageous in other venues, and hence not in our students' long-term interests. In effect, we suggest that IT operates *against* critical thinking, critical reading, and the writing of critiques. Indeed, it looks like a classic instance of the "applied linguist's dilemma" regarding how to marry our profession's capacity to articulate surface features (such as a graded representation of comparative statements) into our perceptions of rhetorical strategy. We have suggested here that a switch from IT to Data Commentary sets up prior interpretive, critical, and textual expectations, within which linguistic realizations (e.g., lexical and grammatical choices) can then form a more appropriate and incorporated place.

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Notes:

1. Actual scores that can be given by raters are: 63, 67, 73, 77, 83, 93, 97.
2. The students' names have been changed for reasons of confidentiality.