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2. Questionnaire # 2 to be applied to service English teachers at the National University of Colombia. The questionnaire will be given to the total population since it does not exceed forty. In this survey, the attempt will be made to obtain basic information as to the training and experience of the teachers with reference to the English language or with other subjects; as to the orientation that should be given in Service English courses, as to their attitudes toward the subject; as to their reactions to instructional materials presently used in the department; and in the event that a change of materials be contemplated, as to how this change should and could be evaluated.

3. Questionnaire # 3 to be applied to Deans and Directors of the different faculties and departments of the National University. The questionnaire will be given out to the total population which includes the following faculties: **Medicine, Agronomy, Arts, Sciences, Social Science, Dentistry** and Law. By means of this questionnaire an attempt will be made to determine which departments and careers require English of their students and which do not; if in their opinion the present courses in Service English meet the real needs of their students or not; if they consider it necessary to require English of their students; in what way(s) English will serve the students while they are studying and later in their professional lives; and finally, to give bibliographical data drom their speciality which is required of their students in English.

4. Questionnaire # 4 to be applied to a random sample of students total enrollment in Service English I. With this questionnaire, the characteristics of the population: present study status, age, sex, attitudes toward English, their career and semester in it, where they come from, their previous studies both in English and in other areas, the aspects stressed in their previous studies of English, why they are studying English, if they feel it is necessary and what for, the contacts they have with the language, its importance in relation to other languages and the knowledge they have of English will be determined.

CONCLUSION

As you can see from this study, the questionnaires will reveal the present situation as well as the ideal situation, in part. The questionnaire as part of the instructional design will enable the researcher to prepare material to bridge the gap existing between the two situations.

7.1.2 TOWARDS A CODING SYSTEM FOR THE ARGUMENTATIVE FUNCTIONS OF LANGUAGE

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A basic assumption present, implicitly or explicitly, in the development of English for Science programs is that scientific English is different from everyday English. Investigation of the extent to which this is so is not a trivial problem. To illustrate the considerations that need to be made, a few uses of the verb <u>can</u> are presented in the sentences below.

1. "He can't see." (Because he is blind)
2. "I can't hear." (Because there is too much noise)
3. The ball can pass through hole A or hole B, but not through C.
4. We can see that <u>X = 7</u>.

In sentence 1 the verb <u>can</u> is used to express incapacity depending on intrinsic factors. In sentence 2 <u>can</u> expresses incapacity depending on extrinsic factors. In sentence 3 <u>can</u> expresses possibility. In the last sentece, which is not uncommon in science, <u>can</u> is used as a device to signal that <u>X = 7</u> follows logically from previous assertions. Often, in sentences of this sort, <u>it</u> also means that one or several steps in the argumentation have been omitted.

The examples seem to suggest that:

I. The meaning of <u>can</u> depends on the context it appears in and the 'internal logics' of the argumentation it forms part of.

II. The meaning of <u>can</u> in each sentence could be derived from a general common meaning, that of capacity.

III. Even if II was true, the fluent use (production or reception of <u>can</u> in each case, and specially in 4, could not be expected from a person who encounters it for the first time.

In other words, reading a meaning of <u>can</u> seems to depend in part on understanding what the sentence it appears in is doing in a piece of discourse, what its function is. But the function of a sentence depends in turn on the structure of the discourse itself -and, of course, on the meaning of its constituents, which shows the complexity of the matter.

The nature of language functions in scientific discourse is, thus, crucial to our preoccupation. It is with problems in the identification of the communicative functions of argumentation that I wish to deal with in this paper. I will begin by presenting some considerations concerning the act of definition.

In previous works (Castños a, Castaños b), I have compared definitions from three scientific disciplines, physics, biology, and mathematics. I have found that entities, for example "molecule", "particle", "scalar product", are defined for different purposes. For this reason, definitions can be realised differently content-wise, i.e. an entity to be defined can be associated with different distinctive characteristics, thus making possible different definitions for the same entity. Consider, for instance, the following definitions of <u>molecule</u>: "1) A combination of two or more atoms bound together; 2) The smallest particle of a chemical compound or substance that exhibits the chemical properties of that substance."

The purpose of a definition depends on the purpose of its context, which in turn depends on its place within a unit of discourse. The purpose of a unit of discourse depends on the purpose of the science it forms part of and on the purposes of science in general.

In the works referred to above, the following set of characteristics was also found:

A. The entity being defined is considered for the first time in the sense defined.

B. A definition associates the entity being defined with a set of distinctive characteristics.

C. A definition classifies the entity being defined.

D. A definition establishes the category of the object being defined.

E. The set of associations entity-characteristics can be considered as a set of axioms.

These characteristics 'explain' the different formal realisations of the act of definition. Different forms focus on different characteristics. Consider, for example:

1. A <u>neutron</u> is a subatomic particle which has no charge and a mass approximately equal to that of the proton.
2. The <u>neutron</u>, on the other hand, has no charge and a mass approximately equal to that of the proton.
3. . . . the <u>proton</u>, with possitive charge, and the <u>neutron</u>, with no charge.
4. If a particle has no charge, it is a <u>neutron</u>.

Form 1, "(X) is (Y) which (Z)", is 'nearly ideal' in so much as most characteristics of the act are represented in it. Form 2, "(X) has (Z)", focuses mainly on characteristic B. Form 3, "and (X), with (Z)", focuses mainly characteristics B and D. Form 4, "If (Y) has (Z), it is (X)", focuses on characteristic E; it is interesting that it does so in an indirect manner. Although it is possible to refer to characteristic E directly by introducing the word "axiom", as when number systems are defined, it is more common to use the 'style' of logical argumentation used in contexts where precondition E is focused. (We will later consider this form in more detail.)

The characteristics also explain the coherence of a definition with a subsequent act, like the proof of a theorem (which will refer to E) or an identification (which will refer to B). They are, thus, analogous to the preconditions that explain the realisation of the act of ordering and its coherence with other acts, like rejecting the order or accepting it (see Labov, 1972). I, therefore, believe that it is justifiable to call A, B, C, D, E the preconditions of difinition. Incidentally, due to precondition A, the use of paralinguistic features, like inverted commas or italics, also makes sense; strictly speaking, the entity defined is not part of the vocabulary of the science at the moment the definition occurs.

A consideration of the preconditions of definition leads us to the discovery of a phenomenon that could be called ellipsis in definition. It seems to me that there are two types of such ellipsis. In one, not all the "sub-functions" (characterization, classification, . . .) that constitute a definition are marked explicitly. Some instances of this type of ellipsis might be explainable in terms of conventional textual ellipsis.

In the other type of ellipsis, one act performs the function of two. In mathematics, for example, definitions often take the form of implications. Generally, in this field much is made of the fact that implication does not mean logical equivalence ("A if and only if B" means "A if B" and "B if A"). Therefore, in derivations or equivalence the implications in both the "senses" required by equivalences are presented. However, this is not the case with definitions.

In a definition, as the characteristics are distinctive, they imply the entity; as the entity is a category, it implies the characteristics. When the definition takes the form of an implication, this is not made explicit, e.g. in: "DEFINITION 6.2. A linear programming problem is said to be non degenerate if every mxm submatrix selected from the mx(q + 1) augumented matrix (A,B) is nonsigular. (Beaumont, 1963) The implication in one sense means implications in both senses (equivalence). This type of ellipsis cannot be explained in terms of textual ellipsis. For the cases where no textual explanation for ellipsis is possible, I propose the term ellipsis in discourse*.

The study of the preconditions of definition provides some insight into the nature of comprehension of scientific language. It seems that it would be erroneous to say that scientific language is completely different from common language. It would not be sensible to say that in everyday conversation people do not define; they do so to agree on what they are talking about. However, the intricate interrelation of argumentative acts, the different types of purpose operating simultaneously at different levels of generality, the intimate relation between context and argumentative function, and the phenomenon of ellipsis in discourse with its peculiarities suggest a high degree of refinement and complexity in scientific language.

Sophistication, which I think will not necessarily exist a priori , is a nearly essential difference between common and scientific languages in the sense that its lack could well result in incomprehension of scientific language. Intuitively, I propose a model in which common and scientific language are sets that intersect in a broad area and in which the elements specific to scientific language depend on the common elements; the former are built upon the latter. It is the task of a person learning scientific language to do the construction.

To solve the problems of how different scientific language is from common language and how different are the languages of the different sciences, systematic comparisons between them are needed. At present, we have tools to make the comparisons at the levels of lexis, structure, and text, and some such comparisons are being made. However, it seems to me that to interpret the results of such comparisons properly, results concerning the discourse level would be required. As Widdowson has pointed out, " . . . a knowledge of how the language functions in communication does not automatically follow from a knowledge of sentences." (Widdowson, 1972).

Comparisons of the type we are interested in require a coding system for the communicative functions of language, specially the argumentative ones (definition, classification, generalization, etc.).

It seems that most expressions relevant to an argumentation are associations of an entity with characteristics. Distinctions between these two parts of expressions

* Here I am taking Widdowson's text / discourse distinction further than in Widdowson, 1972. Ellipsis is not only a feature in text, but also a discourse.

have been made. In grammar they have been called psychological subject or theme and predicate or rheme (see Halliday, 1970.) In logic they are simply called subject and predicate.)

In general the subject has the referential value. However, in a definition the reference lies in the predicate, in the set of characteristics associated to the object being defined. If we omit the predicate, we do not know what the author is talking about. However, if we omit the subject we do know. This distinguishes a definition from any other act.

I believe operational definitions for most argumentative functions will be possible in terms of referential and truth values. That is, by considering what an expression refers to (an object of the world, an abstract one, one previously referred to, etc.) and how true (logically and observationally) it is at the moment it appears, we will know which act it is performing. Moreover, it will not be detrimental if we cannot do this for all functions, if we have to define some in terms of others. If we have defined at least one independently, the system will be consistent.

It may seem that we have defined definition objectively as an expression whose reference lies on the predicate (see Castaños b). The fact is that in a definition the subject-argument does not have the reference <u>that the theory it is going to be part of requires</u>. For example, <u>air</u> usually means "that which we breath". This may be insufficient for theory that requires careful measurements of air and a replication of those measurements; a definition in terms of its components will be required.

We are, thus, confronted with the question: How do we know what degree of precision a scientific theory demands?, which partly means: By which mechanisms are the preconditions of a definition set up? When we have answered the question, the characterization of definition in terms of referential value will be operational. Sometimes the word "defined" expresses the need to define an entity. However, this is not always the case. The author may be establishing criteria for defined entities, <u>defined x</u> rather than <u>X</u> being the object of the definition. Further, the word does <u>not appear</u> always; consider for example what Selinker, Trimble, and Trimble call "implicit definitions" (Selinker et. al., ibid.). This means that before we attempt any counts of even this simple act, we need at least a general understanding of other acts and of the whole structure of discourse.

In the second part of this paper I will present a rather schematic account of the development of science incorporating different aspects that philosophy of science has considered. From this account we will obtain a list of argumentative functions and a general picture of scientific discourse, which I hope will be the basis for the coding system needed. I will, finally, present a few considerations that could be useful in syllabus design for EST.

The first stage in the development of a branch of a science is an observation of the aspect of reality to be studied. Then, an abstraction of the relevant features (variables, characteristics, etc.) takes place. In the next step, a theory to account for the phenomena of the aspect of reality under study is formulated. The theory consists of basic concepts, basic principles, empirical consequences and an intended range of application.

On the basis of the account presented, it is possible to produce another in terms that will be useful for language researchers and teachers. I present below a "linearised" model in diagramatical form*:

Obtaining data from the world	
	1. Observing the world (objects, phenomena . . .)
	2. Comparing (through observation or symbolically).

* The terms here are being used without precision.

inducing	3. Abstracting relevant characteristics of objects and phenomena (primitive formation of concepts).
	4. Generalizing.
	5. Defining first concepts (having a rather close connection with reality)
deducing	6. "Concretion" (association of first concepts with objects and phenomena that represent them in reality)
	7. Classifying (concepts, objects, phenomena)
obtaining data from the world	8. Observing relations between characteristics (concepts) as represented by objects and phenomena.
	9. Comparing relations.
deducing	10. Abstracting relevant relations.
	11. Generalizing relevant relations.
	12. Formulation of "first" laws.
	13. Selection (Abstraction) of the relevant concepts and laws from previous abstractions and generalizations.
axiomatizing	14. (Ad hoc) definition of concepts and principles (including logical ones) that make the theory 'fit', coherent.
inducing	15. Obtention (logical conclusion) of other laws.
	16. Deducing of examples (second type of concretion) of objects and phenomena that represent concenpts in the real world.
	17. Deduction of relations that are to hold according to theory ("prediction") (special type of concentration + logical deduction)

obtaining data from the world

18. Structured observation of reality.

19. Expression of the observation.

20. Comparison of 19 with prediction.

From this diagram, and making the assumption (idealization) that the definitions, classifications, etc, in the different parts of it are essentially the same, we obtain the following list of argumentative functions: Expression of an observation, Comparison, Abstraction, Generalization, Definition, Classification, Concretion, Logical conclusion, Prediction. It seems that, due to the way it was obtained, the list will serve to code the argumentative level of scientific discourse nearly comprehensively.

Other levels, e.g. that of value systems (how elegant a theory is, etc.) and that of "pedagogical" devices (example, summary, etc.) will require other categorie I, thus, believe that we will have obtained most of the categories of a coding syst for the argumentative functions when we have specified, in addition to an inform definition, preconditions and operational defintions to each of the following functions:

	INTUITIVE DEFINITION	PRECONDITIONS	ATTEMPTED OPERATIONAL DEFINITIONS
Expression of an observation	Association of an object with characteristics/considered to be observationally true		
Comparison	Finding similarities and differences in the amount and type of characteristics (symbolic)		
Abstraction	Selection of (type of) characteristics relevant/considered worthwile studying		
Generalization			
Definition	Grouping characteristics to be considered in sets/naming the sets		
Classification	Allocation of objects under categories already (defined/ "identification" (symbolic)		
Concretion	Identification of objects in the world that represent concepts because they have characteristics/"looking for reference"		
Logical conclusion	Obtention of valid assertions from others considered accepted		
Prediction	Rendering concretion + logical conclusion in testable (falsifiable) terms.		

It seems to me that these functions belong in the same rank, although it is not as clearly delimitted as ranks in other coding systems, e.g. Sinclair and Coulthard's (197). Provisionally calling this "rank X", other ranks of scientific discourse might be:

Rank X + 1:

Obtaining data from the world/
inducing/axiomatizing/deducing

Rank X + 2:

Gathering and processing data/
constructing a theory

Rank X - 1:

Associating entity to characteristics

Rank X - 2:

Referring

The system could serve as a basis for syllabus design even at this intermediate stage of its development. We would have to reconsider some of the aspects of the diagramatical model that have been omitted, like phenomena, relations and laws. It seems to me that the best way of doing so would be to produce a taxonomy of the categories in the system. We would obtain subcategories such as: Abstraction or a relation, Abstraction of a phenomenon, Logical conclusion of a relation, Prediction of a phenomenon, etc. It is interesting to note that the first term in the name of a subcategory would be a function and the rest a notion. At present, EST courses tend to concentrate their attention on either functions or notions, the FOCUS and NUCLEUS series being prototypes. A syllabus focusing on the type of subcategory suggested above (pure function + notion) would pay fair attention to both functions and notions. It would contain lessons on, say, Expression of observation of location of an object, and Prediction of (future) location of an object.

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7.1.3 THE TEACHING OF ENGLISH AND ESP AT SECONDARY SCHOOL LEVEL

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It is the purpose of this paper to present some problems which have been worrying some of us involved in teaching English and in teacher training in Brazil, as to what regards the position of English and ESP at secondary school level.