The Discourses of Science in French Universities

The Nuffield course in French for Science and Engineering students (*c.q.f.d.* *Le français des sciences et des techniques*, publication in 1997) is designed not only to provide a course in French language for a broad range of science and engineering students, but also to be a preparation for students in those disciplines intending to study in a French university. The Nuffield Team has therefore had to look closely at the various types of discourse science and engineering students would need in a French university. This work began with specifically linguistic discourse analysis, as we tried to identify the linguistic structures and skills the students would need. As the work progressed, it became apparent that the types of discourse and, indeed, the types of study skills required varied significantly according to the particular learning situations being examined. This article outlines some of the preliminary work necessary for the production of the course. It shows how the analysis of the language which would be required by British science and engineering students going to study in France led to an equally necessary analysis of the situations in which that language would be used, and so to an examination of the whole complex extra-linguistic situation in which the sciences are taught and learned in French universities.

The first step in the discourse analysis for the Nuffield Project was to create a corpus which was to serve as a basis for the identification of the specific types of language the students would meet. The original corpus (which is still being added to) was composed of sound recordings made in Paris-Sud (Orsay) and the IUT1 in Grenoble in November 1993, and of videos filmed by the Nuffield team in the Université Fourier and in the IUT1 in Grenoble in March 1994. For comparative purposes, a written record of some science and engineering lab classes in the University of Dundee has been prepared. This corpus is the basis of on-going research in discourse analysis which will feed into the Nuffield course.

Since the members of the team are not scientists, the language science and engineering students will need was new to most, both in French and in English. As the analysis progressed, it became apparent that the linguistic preparation of British students for their time abroad, and the provision of help for their tutors (mainly from arts disciplines), required not only a knowledge of the relevant

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features of French, but also an awareness of the situations in which the language would be used. This took the analysis of the corpus beyond the purely linguistic to areas of study skills and to wider contextual and socio-linguistic domains.

The fact that no discourse can be fully understood unless its relationship to other discourses and to the world in which it occurs is taken into account, is recognised by pragmatic linguists. This wider context is described by Maingueneau (1984) as the *espace discursif*:

> [Le texte] ne fait qu'un avec son émergence historique, l'espace discursif à l'intérieur duquel il s'est constitué, les institutions à travers lesquelles il s'est déployé, les isomorphismes dans le réseau desquels il a été pris.
> (1984: 206)

Maingueneau extends the importance of the *espace discursif* and the defining influence of the communicative situation on discourse to include the *inscription historique* which he sees as essential in establishing an *identité énonciative*.

> Pour peu qu'on autonomise les énoncés à l'égard de leur inscription historique on se trouve emporté dans un univers sans repères, sans liens stables, ...Constituer la discursivité en objet, c'est supposer qu'en toutes circonstances il n'est pas possible de dire n'importe quoi, n'importe comment et en n'importe quel lieu et que ces coordonnées définissent une identité énonciative.
> (1984: 207)

Analysis of the Nuffield corpus of French and British university science classes shows that there are a number of basic similarities between science and engineering education in Britain and in France. In both countries for example there are lectures (*cours magistraux*), tutorials (*travaux dirigés*) and laboratory classes (*travaux pratiques*). It is therefore reasonable to suppose that the students will immediately recognise some elements of the *espace discursif* and understand broadly what type of linguistic activity is expected of them, even though their level of linguistic competence in a foreign language may be insufficient to allow them to communicate fully and appropriately. They may have particular difficulties in recognising register and in judging the appropriate degree of

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formality or informality when speaking to their lecturers in France, since the traditions in this regard are different in the two countries.

Their language tutors in Britain may, because of their arts backgrounds, find the *inscription historique* and the *identité énonciative* of science and engineering teaching and learning, whether in the UK or in France, very foreign and discouraging. This can give rise to the « I'm not a scientist, of course » syndrome, with tutors feeling unable to take the scientific dimension seriously. It can also create a gulf between tutors and students and limit the usefulness of the linguistic preparation given to the students.

The following analysis of the various situations in which British science and engineering students will find themselves examines both those situations where they will have to use French and the wider context in which the strictly « communicative » situations are set. It is intended to help in solving the students' problems with the foreign language and with the foreign learning situation, and also the possible problems encountered by their tutors in Britain, for whom the teaching and learning patterns of science may be « foreign ».

Language tutors who do not always share the same *espace discursif* as their colleagues in the sciences, where teaching, learning and discovering have their own patterns and require specific learning and reading skills. This difference between the experience of the tutor and the student is a general problem in teaching languages for special purposes and one aspect of it, the *travaux pratiques*, has been dealt with in detail elsewhere (Adamson 1994).

One block or frame of a science or engineering course will normally have as its main element (from the students' perspective) a group of the various types of classes they will attend at regular intervals. They will be required to perform a

number of different activities in their classes which lead to a laboratory class and culminate in the production of various sets of notes and a lab report. They will also be required to do various types of work in their own time. The work over a term, a semester or a year will consist of a number of such frames or blocks, each connected in some logical way with the preceding and the succeeding one, and containing the same activities in the same sequence.

Timetabled classes: A typical course unit is composed of 2 (or more) *cours magistraux* (CM) which are inter-related in a logical and necessary way. A tutorial (*travaux dirigés* — TD) follows each lecture at a variable interval. In France, the TD normally last for at least 2 hours and they are, like the CM, linked closely in content to the even longer (probably 3 hour) laboratory sessions, *travaux pratiques* (TP).

Written work: For each of the formal courses, CM, TD, TP, students will need to take notes. They will also take notes from the textbook and during the *groupe de travail* if they attend one. There are thus four or five sets of notes which will vary in type and style depending on the type of class or private study activity. The skills involved in taking these notes will also vary (see below, **Lectures**). Here we are on the boundary of study skills and linguistic skills. The connection between the class work and the notes is a necessary and direct one. It is usual for some of the solutions to the problems to be dealt with in the TD to be prepared by work done outside the classroom before the class meets, and these have a direct connection with the TD which takes place later. The culmination of this part of the course is the lab report, the form of which is normally governed by tradition. The British version is usually well known to science students by the time they come to university and is reinforced once they are there. They will need additional precise instructions about the format required in France from their language tutors and from their lecturers once they are in France. Again, guidance in the preparation of the lab report crosses the boundary between linguistic and study skills.

Private study: Ideal students are working hard outside their timetabled hours. They may, if they wish, or if they are strongly encouraged to do so, set up a small working group with other students, a *groupe de travail* (GT). The work done here will probably arise (more or less directly depending on the students) from notes they have taken in class or from the textbook. It will involve much discussion of an informal kind with fellow students and the writing down and working out of solutions. Every day, students should be doing some work on their lecture notes and on the textbook. They will be reading, taking further notes, amending notes already taken and possibly working out solutions. They may need the special skills associated with computer assisted learning, and some of their private study may also involve the use of video. All the parts of the course are in a necessary, if sometimes indirect inter-relationship, and awareness of this should help foreign students to adjust their

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working patterns so as to gain maximum benefit from each of the contributing elements of their course.

One discourse or many?: The discussion so far makes it clear that the students will be operating in an interlocking network of teaching and learning situations (Maingueneau 1984: 207 *réseau d'isomorphismes*) with three main components, class work, required written work and private study. The linguistic competencies and study skills they will need will vary from one component to another: for example: reading the textbook, note taking in class, speaking in a GT. Within each component, a unique combination of several linguistic skills may be required: understanding spoken French, reading from the board and note taking in a lecture; understanding spoken French, reading from the board, speaking (both to other students and to the lecturer) and note taking in a TD; taking notes, reading, speaking to other students and speaking to lecturing and technical members of staff in TP. French preparation classes for these students can benefit greatly if these various aspects of the *espace discursif* are taken seriously, and the teaching shaped to fit the varied requirements of the students. The video section of the Nuffield corpus (a selection is available to those interested) illustrates clearly the multiple types of linguistic skills the students will need.

The notion that there is a single « language of science », marked by a number of clearly identifiable and predictable features, is thus not appropriate in the linguistic preparation of science and engineering students for the complex context in which their various uses of French will occur. Analysis of the language exclusively of written scientific texts will not produce descriptions which take into account the diversity of the situations in which our students will be using French. This analysis of a single communicative situation — of science textbooks, or of written articles, for example — has led to the idea of *le discours scientifique* as a particular type of *discours expositif* which is a *discours de la vérité, ...de l'objectivité ...[qui] exclut tout dialogue avec les destinataires* (Peytard and Moirand 1992: 171-2), or *[un discours qui] vise à faire savoir* or *se doit fonctionnellement d'apporter le plus rapidement possible la solution au problème que se pose son « lecteur »* (Bouchard 1991: 53, 55).

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The idea of a single, stereotyped scientific discourse is questioned by some linguists, including Loffler-Laurian (1983) who echoes some of the views of Maingueneau above. She insists on the necessity of identifying the *situation de communication scientifique particulière* (13), and of taking into account the *types de situations, [les] types de discours, [les] types d'énonciation ...propres à chaque type de discours* (20). Such an approach seems appropriate for the type of analysis undertaken here.

Taking into account the need for identifying all the features of communicative situations, it is possible to identify at least four important different situations in which British students will need to use particular groups of French language skills. These are 1: lectures (CM), 2: tutorials (TD), 3: lab sessions (TP) (the three main types of class identified above) and 4: private study. The *groupe de travail* could be added, but since this is not obligatory, and since the discourse involved is also required in TD and TP, it is perhaps not necessary to deal with this situation separately.

Each of these four situations is structured differently. Thus it follows that the ways in which language is used in each situation will be different and that each situation will involve a different combination of the four skills: reading, writing, listening, speaking. The study skills required will also vary according to the situation.

<div align="center">Lectures</div>

The main linguistic activity in lectures is listening to the lecturer, who will use a variety of spoken forms of the language, including a written form delivered orally (*écrit parlé*). The linguistic outcome from the various forms is note taking. The organisation of the basic linguistic material by the lecturer is in some ways similar to the way a textbook is organised, and recognising this similarity may help the students to understand the material being presented to them, and so to take accurate and appropriate notes. The type of notes taken by science students is very different from those arts students need to take, and the language tutor will have to take this into account. The ability to transfer material neatly and accurately from the blackboard for later study is crucial, as is immediate understanding of the French pronunciation of familiar and unfamiliar formulae, mathematical processes and numbers, for example.

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If we consider the fundamental structure of a lecture course, we can see similarities between it and a textbook. Each lecture in a course, and each chapter of a book, is followed by the next and connected to it in a logical way. Each (assuming the course or the book has been well prepared and is well presented) is part of an organised whole, the parts of which are in a clear and necessary relationship with the others.

At the next level, the structure of a single lecture and of a chapter of a textbook also resemble one another. Each is composed of a number of sections of variable length, which succeed one another in a linear fashion. Between these sections there is normally a necessary and logical progression and their order cannot be changed without causing problems for understanding and learning. Students will be aware, although probably not consciously, of this type of interlocking structure in the material presented in textbooks and lectures, since the same patterns are found in their course materials in English. They can therefore be trained, in their language classes before they go to France, to recognise the French language structures which signal such interrelationships and to make maximum use of them in decoding what they hear and read, and they can be taught to adapt their existing study skills to the foreign environment.

Understanding the first part of a book or a lecture should be a considerable help in understanding the second, and so on. For students of a foreign language this is a great benefit, since recognising familiar material will give confidence and should reinforce learning. Close analysis of the language of both lectures and textbooks shows that familiar subject matter recurs in successive sections, and there are in each case a number of linguistic markers of structure which are predictable and are welcome *points de repère*. Each author or lecturer will have a personal style, and once elements of this have been identified, understanding is greatly helped. For example, instead of being irritated by the repetition of *Eh bien!*, *Alors!* or *D'accord?* in a lecture, students can be trained to see these, or other such repeated structuring expressions, as indicators of a progression from one section of a lecture to another (Ali Bouacha 1981). These can aid comprehension and can be taught to students in the language preparation they receive before they go to France.

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The other similarity between lectures and studying with a course book is that the student is not required to make an active oral intervention. Because it is possible to concentrate only on comprehension (aural or written), the complexity of the linguistic response of students is greatly simplified. Their foreignness is not an issue, they feel less threatened and their knowledge of their subject in their native language will probably allow them to perform the linguistic tasks involved satisfactorily.

Tutorials

In *travaux dirigés*, the situation becomes more complex. In TD students are, as they are in lectures, listening, reading from the board and taking notes. The situation is, however, different in several important ways. Each of the TD is self-contained and they do not necessarily follow logically one after the other. The content of each of the *travaux dirigés* is largely predictable: the connection between the TD and the preceding lectures is (providing the students have attended them) immediate and direct, and TD are usually also based on handouts given to the students beforehand. However, the lecturer will often choose to treat or to ask the students to work on only some aspects or problems, and foreign students will have to understand when the selection is announced. This is the first element of unpredictability in the TD.

Another element of unpredictability is the amount and type of linguistic interaction expected from students. In TD, oral interaction is of three kinds: the lecturer and a single student; students among themselves while they are working on a problem; students socialising. The first of these is very difficult for a foreign student. It requires recognition of the sometimes very fine distinction between a rhetorical invitation to comment (*Tout le monde a compris?*) and a serious expectation that a student will offer a comment or signal his or her failure to understand an explanation. The difference is sometimes only one of intonation — a great problem for foreign students — and the type of interaction called for — speaking appropriately to the lecturer in front of the class — may be excessively daunting.

Social interaction is naturally very wide-ranging and cannot be defined in the context of the teaching and learning of science and engineering. Although students may find it difficult in the classroom, it is a linguistic

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essential if they are to be accepted. However, it is not public in the same way as responding to the lecturer, and offers multiple possibilities of repair if misunderstandings occur. From the point of view of the linguistic preparation of students, the most important of the three types of oral interaction in a TD is the discussion and cooperation between students when they are working together on elements of problems set by the lecturer. Since it is important for the students to obtain maximum academic and social benefit from their studies, their French tutors should try to make sure that the linguistic preparation they receive helps them to use appropriate French in appropriate ways. In TD this involves acquiring the linguistic skills to enable them to discuss their work with other students, and to offer and respond to help with problem solving.

<p align="center">Travaux pratiques</p>

There has been considerable preparation for these, in *cours magistraux*, in *travaux dirigés*, perhaps in *groupes de travail*, in work with textbooks and lecture notes. The more technical aspect of the vocabulary should therefore be well known to students. The change of situation from the classroom to the laboratory may, however, pose other problems. Here students will be reading the description of an experiment, taking notes, preparing their report, listening to instructions from the lecturer and the technical staff and speaking both to them and to one another. Again there will be a mixture of academic and social interaction. Because the atmosphere is more relaxed, and work takes place in small groups, the situation will probably be perceived by foreign students as less linguistically threatening than a TD. There is an opportunity to repair communication, and the threat of possible disaster (an explosion, personal injury) if instructions have been misunderstood, may act as an incentive to accuracy. This may not be the ideal motivation for improving communication but it may have the effect of sharpening the students' listening skills.

Conclusion

This description of the situations in which science and engineering students will find themselves in France has attempted to highlight the variety of the linguistic skills they will need. These include the ability and the willingness to use, both in written and in spoken French, the language needed for express all types of measurement, numbers, quantities, shapes

and sizes. Students will need, for example, to be able to use French to make comparisons, to express hypotheses, to state conclusions. They will need training in the use of impersonal and nominalised and other recurrent constructions. In addition to helping them to acquire these linguistic skills, their language preparation must sensitise them to the wider context of their studies and to the particular types of language appropriate in a limited number of different, but frequently encountered, situations.

This article does not seek to provide a detailed programme of linguistic preparation for intending exchange students in science and engineering. It has tried to show how, in the creation of a language course for special purposes, the whole context in which the target linguistic activities take place must be taken into account. Once this context has been established, it is possible to proceed to the next, more purely linguistic, stage of the research, in which a priority is established for the different language skills required. It is then that the actual language used in real situations can be analysed and appropriate language courses for special purposes can be built around the results.

To extend the idea of the importance of context further, it is also helpful to analyse the situation in which the linguistic preparation programmes for this special group of students are delivered in their home university. This will allow full benefit to be derived from what both language tutors (usually not specialists in the target domain) and their students bring to the language classes. The fact that the tutors may come from a different background, and may be accustomed to different discourses and different teaching and learning situations from the students, may make teaching the relevant language skills difficult and even unpleasant for some tutors. If the reason for this is understood, it may be easier to deal with. Another benefit may be derived from recognising the similarities between familiar and target situations. In the case of French for scientists and engineers, looking for parallels between the discourses of science and engineering in British and French universities may help to encourage the students to contribute more to their own preparation. The tutors' job may be simplified, and the students' learning facilitated, if it is possible to use and

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develop the students' passive knowledge of the teaching and learning patterns, and of the discourses, of their specialist domain.

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