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Language and school subjects

Linguistic dimensions of knowledge building in school curricula

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LIST OF DOCUMENTS WHICH PROPOSE ELEMENTS FOR THE DESCRIPTION OF LINGUISTIC COMPETENCE FOR SPECIFIC SCHOOL SUBJECTS

1. *Items for a description of linguistic competence in the language of schooling necessary for teaching/learning history (end of obligatory education)*

An approach with reference points - Jean-Claude Beacco

2. *Items for a description of linguistic competence in the language of schooling necessary for teaching/learning sciences (end of compulsory education)*

An approach with reference points – Helmut Vollmer

3. *Items for a description of linguistic competence in the language of schooling necessary for teaching/learning literature (end of compulsory education)*

An approach with reference points – Irene Pieper

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Table of contents

Introduction.....	5
1. Language and knowledge	7
1.1 The relationship between knowledge and language.....	7
1.2 The “conventions” of scientific, technical and artistic communication	8
1.3 Linguistic characteristics of scientific, technical and artistic communication	9
1.3.1 <i>Vocabulary and texts</i>	9
1.3.2 <i>Discourse genres</i>	9
1.4 The diversity of scientific, artistic and technical discourse genres	10
2. General forms of classroom communication	12
2.1 Teacher-learner interaction	12
2.1.1 <i>Monologic instruction</i>	12
2.1.2 <i>Dialogic instruction</i>	13
2.2 Learner-learner interaction.....	13
2.3 Formats of communication and learning	15
3. Forms of communication in the teaching of scientific, artistic and technical subjects	16
4. Discourse competences for learning in scientific, artistic and technical subjects.....	17
4.1 Cognitive genesis: an intertextual path.....	18
4.2 The successive forms of language competences in school subjects	19
4.2.1 <i>Taking the I-here-now out of learners’ utterances</i>	19
4.2.2 <i>Text sequences representing cognitive operations</i>	20
4.2.3 <i>Forms of scientific discourse genres in the classroom</i>	23
Concluding remarks.....	26

Introduction

Purpose of this text¹

Whatever the subject, all knowledge building in the school context involves working with language. The purpose of this text is to suggest a general approach enabling different levels of specification of these language dimensions to be classed in transversal descriptive categories. The aim is to describe the process leading from units for analysis of actual uses to the identification of linguistic forms and mechanisms appropriate to those uses².

The emphasis here is more specifically on the relationship between knowledge and the language of schooling. The *Platform of Resources and References for Plurilingual and Intercultural Education* includes two documents illustrating ways of moving, in a given school subject, from educational values to linguistic forms in several analytical stages. One of these documents deals with history, the other with experimental science. They are the work, respectively, of Jean-Claude Beacco and Helmut Vollmer (see 4.2.2.). This document generalises and offers arguments in support of the procedure employed for these two somewhat illustrative cases.

It is aimed not only at the authors of curricula and textbooks and the designers of tests, but also at teachers, and especially teachers of subjects sometimes quite wrongly described as “non-linguistic”, to draw their attention to the language components of work in their subject. It is also relevant to teacher trainers, particularly those responsible for the teaching of disciplines other than languages taught as a subject.

The underlying assumption for such an approach, therefore, is that knowledge building in the different subjects depends to a great extent on a better command of the scientific, artistic and technical discourses³ produced in the language of schooling. Often, however, this language is deemed to be common and assumed to be transparent, in other words the specific nature of scientific discourses is reduced to a specialised lexicon. A good many pupils – and particularly a good proportion of those from disadvantaged backgrounds – encounter learning difficulties which are due not only to a discrepancy between their spontaneous knowledge and the knowledge to be acquired, but also to the fact that their discursive repertoire (the discourse genres which they know and practise) does not include – or includes only to a small extent – scientific discourse genres⁴.

Role of this text in promoting plurilingual and intercultural education

Enhancing and broadening learners’ language repertoires and improving their command of discourse genres is one of the goals of plurilingual and intercultural education. The right to quality education therefore includes the right for children attending school to gain practical experience of discourse genres whose command (to varying degrees) is necessary for

¹ This text draws on numerous bibliographical references. However, given that it is not an academic text but a document mapping out a curriculum, aimed at readers who are not necessarily specialists in linguistics or teaching theory, the authors have decided, with the occasional exception, not to mention them.

² In the work of the Council of Europe’s Language Policy Division, this objective is in line with a set of tools available to the parties concerned (curriculum designers, textbook writers, teachers). For example, in the case of foreign languages, the different *Threshold Levels* sought to relate functional descriptors (e.g.: “congratulate”) and notional descriptors (e.g.: “anteriority”) to linguistic utterances in a given natural language (e.g., in English, for “congratulate”: *Well done!* or, for “anteriority”: *before, previously*). The language-specific reference frameworks represented by the *Reference Level Descriptions*, which are aligned with the levels of the *Common European Framework of Reference for Languages*, meet this same need for instruments linking communicative uses and linguistic material, via a kind of “embedding” of operational categories.

³ This refers to school subjects other than the language of schooling as a subject.

⁴ For the purposes of this document, « scientific » is used to refer to all sciences, whether « natural » or « social ».

personal development and the exercise of critical citizenship. In such a perspective, it is also the function and responsibility of education systems to familiarise all the young people who go through them with discourse genres having a social, professional or practical relevance, and especially with those involved in societal choices and those produced by the scientific communities. The inclusion among the goals of education of both democratic citizenship and the knowledge society means giving young people attending school the language resources needed for membership of and participation in different communities of practice, i.e. components of society characterised, *inter alia*, by the discourse genres prevalent within them.

Specifying the linguistic dimensions of knowledge building is not confined, therefore, to proposing descriptive categories that serve to bring out linguistic characteristics and conditions of the operation of scientific discourses. Insofar as the most generic of these categories take account of the social groups and practices with which such discourses are associated, they apply transversally to other discursive practices, and in particular those found in educational contexts, and link the latter with the outside world and with their overall educational goals.

General structure of the text

This text reiterates the complex nature of the relationship between knowledge and language (1), emphasising that the specific nature of scientific communication is not confined to the terminology used. It stresses the concept of discourse genre, describing it in particular, but not exclusively, in relation to texts circulating within scientific communities. The general forms of classroom communication are analysed in (2) and discussed in relation to forms of learning. Scientific, artistic and technical subjects are then addressed *per se*: the relationship between forms of discourse and forms of knowledge building is shown. The latter follows a path that goes from a speaker-centred to decentred utterances, then to text sequences produced in isolation or as part of classroom interactions representing intellectual operations (such as comparing or deducing), and finally to texts satisfying genre norms, those of “school scientific genres” (also known as “parascientific” genres, which are not used outside school), or sometimes to prescientific genres (report on an experiment, data commentary etc), especially in upper secondary education, where they provide an introduction to the scientific texts of university education and those of scientific communities (4). As the text proceeds, an indication is given of the approaches which should make it possible to identify, for each language and each subject, the forms of language that should be systematised with learners, thus moving from descriptors similar to those of the *Common European Framework of Reference for Languages* to shared description protocols or approaches.

1. Language and knowledge

The comments below are intended to enable the main language of schooling (French in France, Polish in Poland, Greek in Greece etc) to be given its rightful place in the teaching of school subjects. By school subjects we mean subjects as they are named and defined in primary and secondary education. These divisions into school subjects do not necessarily correspond to disciplinary fields: for example, there are courses in history/geography, physics/chemistry and life and earth sciences, which do not coincide with scientific domains. Classes devoted specifically to the language of schooling (“French”, “Polish”, “Greek” etc) must also be included among these subjects: in some respects, they are also a medium for knowledge transmission (history of the language, word formation, analysis of sentence construction, stylistics etc), and it is often their role not only to develop communicative abilities but also to encourage thinking about the language, verbal creativity and an aesthetic appreciation of creative work in the language (literature). These classes in the language (of schooling) have transversal responsibilities because they are about language and the language(s) of schooling, but they serve their own purposes and are therefore not necessarily open to other subjects: while a command of spelling is an asset for written texts in all subjects, the texts to be produced in the subject “language (of schooling)” are probably not transposable as such to other subjects. These have, as it were, a specific “linguistic responsibility”, which does not lie exclusively with the subject “language”.

Before addressing the language dimensions of the teaching of knowledge (scientific, technical and artistic; see 2), we will address the issue of the relationship between language and knowledge.

1.1 The relationship between knowledge and language

Language is not only an instrument for social communication. Language has been used, through oral transmission and writing, to fix and store information and knowledge. As well as enabling it to be transmitted over time, this verbal representation of knowledge has allowed for discussion and scientific disputes, which are essential, from the epistemological point of view, to question and ensure its validity. It also makes it possible to disseminate knowledge in such forms as education in the strict sense or popularisation (which takes place outside educational institutions), or operational formulations within specific applications (e.g. in the form of instructions, directions for use, protocols, recipes etc).

Many types of knowledge can be expressed in semiotic systems specific to them which make little use of language: mathematical writing, symbols, formulae, statistics, maps, diagrams, photos etc. These codes are self-contained, but they need to be verbalised for purposes of discussion, commentary or teaching.

Lastly, it must be borne in mind that some subjects (e.g. social science) do not use language solely as a means of representing knowledge established outside the texts recording it. A report on an experiment or research report transposes into the language of protocols data or findings established independently of their textual expression and fixation. But some knowledge has no existence or substance outside its verbal representation: for example, there is no historical knowledge outside the texts of historians, even if it is built up from data and evidence of all kinds which are commented on and analysed. In this case, language is not only a transmission medium, but a “place” where knowledge is created. This function is also present in the so-called “hard” sciences, which also use language for heuristic purposes.

This brief outline emphasises the diversity of the relations between knowledge and language. The latter combines functions of:

- representation: expounding and disseminating knowledge established independently of language;
- mediation: verbalisation, making it possible to go from one semiotic system to another;
- interaction, allowing exchanges (discussion, debate, disputes) between the producers of knowledge and between the producers and users of knowledge, which may lead to advances in knowledge;
- creativity, because language can be a means of creating knowledge, the creation and writing of knowledge thus being the two sides of one and the same process.

This diversity of relations between language and knowledge prompts us to consider that language is essential to knowledge and to take the fullest possible account of the variety of functions that language can perform (expounding, transposing, transforming and creating knowledge) in the teaching of school subjects and their appropriation by learners.

1.2 The “conventions” of scientific, technical and artistic communication

The scientific and technical fields are defined by shared forms of knowledge building based on common protocols and concepts. In this respect, they are communities of practice which bring together social players sharing research objects, ways of building, discussing and validating knowledge, and a collective history. This collaborative knowledge building, where ideas and results are shared, creates a specific culture and interrelated institutions: team, laboratories, research centres, academies, journals etc. These may be in competition (for funds, patents etc), but they share values (e.g. scientific ethics) and norms (e.g. defining “good” knowledge building or the quality of technical work).

Some of these “norms” define, more or less strictly and explicitly, conventions relating to (verbal) communication in these scientific and technical professional communities. These conventions concern the form of the texts which are produced and circulated in these communities: thesis, paper to a colloquy, report on an experiment, publication of an excavation site etc. To gain access to these communities, there are “rites of passage”, including those providing the opportunity to show that one belongs to the community by mastering its communication conventions (see 1.3.2.).

There is no ritual filtering of this kind at school, although a command of what is considered “proper” language does play a role in this context. But it is well-known that an insufficient command of language can be an obstacle to the acquisition of knowledge, especially for groups of “vulnerable” learners (from disadvantaged or immigrant backgrounds, marginalised groups, etc). If being good at science means also being good at talking about science, acquiring knowledge at school means getting closer to the communities which produce that knowledge by familiarising oneself also with forms of communication specific to them and appropriating some of them.

In other words, it is clear that a command of knowledge can by no means be reduced to a command of the language through which it is expressed: one can know a text by heart without understanding what it is about and without being able to use or explain the knowledge expounded. The language used by learners in scientific, artistic and technical subjects (including, partially, courses in the language(s) of schooling) should be regarded by the teachers of those subjects as a set of outward signs allowing them to observe indirectly the learners’ cognitive gains. But conversely, as it were, if learners master the “right” linguistic means of communication in relation to the particular area of knowledge, that mastery may be able to have a positive influence on their gains and help them to develop the desired scientific attitudes and approaches.

1.3 Linguistic characteristics of scientific, technical and artistic communication

So far, we have talked about scientific “language”, but this concept requires clarification, in particular because the ordinary view would be that it consists of the terminology which essentially characterises science and technology.

1.3.1 Vocabulary and texts

The teaching of these subjects is not simply a matter of learners learning new words denoting new concepts or new categories related to the particular area of study, in the first instance because the words of knowledge are also ordinary words and it therefore involves something other than a set of strictly defined and unambiguous lexical items. It will be important, however, to master, to varying degrees depending on the level of scientific competence aimed for, the rules for forming the terms of specialist vocabularies (e.g. the significance of suffixes (-*isis*, -*asis*, -*osis* etc in medicine or chemistry), the role played by abbreviations (*DN A*), compound word formation, etc). In some national traditions, terms are derived from Greek or Latin (*céphalée* in French), while in others they are closer to the ordinary lexicon (*headache*).

The need for a shared terminology is undeniable (in botany, for example, in view of the many different ordinary names for plants in the different languages). But the teaching (and the practice) of science should also lead learners to relate these terms to one another and understand how they are related. Clearly, that cannot be done simply by naming (defining) things, but involves the use of texts. *Text* will be taken to mean any finite verbal sequence (i.e. having a beginning and an end) produced by a speaker (or by several speakers in the case of teacher-learner or learner-learner interaction), be it oral, written, audiovisual, multi-channel etc, constituting a scientific or pedagogical task. A text consists of one or more utterances (mathematical theorem, description of an experiment, of a mediaeval town etc) linked together to convey existing or evolving knowledge.

So, acquiring the “language” of a science or a technology is not just a question of handling individual terms properly or complying with the general rules of a language (spelling, correct forms etc); in fact, it means showing that one is capable of understanding and producing texts which are consistent with the culture of the particular field or which enable learners to get closer to it.

1.3.2 Discourse genres

These concrete texts do not have a random form left to the personal initiative or creativity of the person producing them: as they are verbal representations of forms of knowledge and modes of communication deemed appropriate in a community of practice (to explain, justify, discuss, disseminate etc), they take on forms that are ritualised to varying degrees depending on the particular field. These rituals may take the form of explicit good formation norms and are to some extent “text rules” comparable, all other things being equal, to grammatical rules. In the case of articles published in journals concerned with experimental science, these rules (specified by the editorial board) concern, for example, the basic structure of texts:

- review of literature on the subject
- problem or question to be resolved
- description of the experiment/ data collection...
- findings
- interpretation of the findings
- contribution to existing knowledge (progress, reassessment).

These forms shared in varying degrees by categories of texts may be termed *discourse genres*. As can be seen, the concept of discourse genre does not only apply to literature (novels, plays, poetry etc), but also serves to define specific categories of texts, of whatever type, which can be described from the linguistic standpoint as being characterised by a structure and verbal forms which, in varying degrees, are ritualised and binding. This verbal production tends to comply with “rules” varying in strictness and in number which define both the content and the structure or verbal form of texts (e.g. use of *I* or *we*, etc).

The relationship between *discourse genre* and *text* is abstract-concrete (only texts are observable; the forms of discourse genre have to be “reconstructed” from them) or model-matrix/realisation-occurrence.

These forms assumed by communication as it is practised in a community of practice are identifiable as such by parameters such as the “place” where they are produced (congress, lecture, science section of a daily newspaper etc), the participants (who writes, listens, reads etc), the medium (oral, written etc)... Discourse genres are generally identified by a name, usually non-scientific in origin, forming part of the ordinary lexicon: conference, treatise, news item, anecdote, dispute, exhibition catalogue, prayer, conversation etc.

Discourse genres are thus the immediate form in which speakers can take hold of language: they are capable of identifying and also producing some of them, even without being taught.

Alongside discourse genres we encounter more abstract terms such as narration, description, order/instruction, exposition, explanation, argument etc. This classification has never really been able to describe text categories because it can easily be recognised that a specific text usually matches several types simultaneously. But this categorisation, which represents a lower level of analysis than that of genres, is nevertheless extremely useful for describing the latter.

Discourse genres can be described by means of linguistic categories (see 4.2.3.), because a discourse genre is a verbal object, albeit distinct from the sentence and the text. In some cases, they may also be described in terms of stable sentence forms (e.g. the form taken by directions for use: *take...put...assemble...*). It should lastly be noted that discourse genres are not universal forms: they are more often than not specific to communities, i.e. also to languages and cultures. Some genres have no equivalent from one language to another (for example, the traditional African *palaver* (French *palabres*) has no real equivalent in British English or the French of France) or they only coincide partially or superficially (*presentations* in English and French). While mathematics is universal in its concepts and procedures, this is not necessarily true of the way in which it is set out: mathematical discourse genres may differ from one language to another.

1.4 The diversity of scientific, artistic and technical discourse genres

In addition to the differences in discourse genres from one language to another, knowledge is expressed and disseminated in the form of different genres. In the case of published texts, for example, the following may be identified:

- genres internal to communities, where new knowledge is expounded and discussed;
- genres for transmitting knowledge outside scientific communities through education (textbooks, course books, summaries etc), with the necessary forms of didactic transposition;
- genres used for dissemination or popularisation: magazines aimed at the general public, encyclopaedias etc.

For example, the space science community disseminates a lot of information to the outside world. As in other fields, the production of discourse for the outside world depends on specific circumstances, such as:

- a discovery, i.e. a publication reporting on an advance in knowledge which is taken up by the media.
- an institutional event specific to the scientific community or institution: prize, congress, colloquy etc.
- a “common” event: science exhibition or disaster leading to the mobilisation of explanatory knowledge (earthquake, flood, volcanic eruption etc; in the case of astronomy: launch of a rocket or satellite, link-ups in space, eclipse, passing of a comet etc).

In addition to this considerable external dissemination of information, which is fairly common to all fields, the space science community of practice exhibits the following further characteristics:

- it continues to capture a wide audience (the conquest of space and the economic and industrial issues involved), concurrently with astrology, which is still active, although often as a recreational interest;
- it enjoys wide dissemination in the outside world, but its dissemination in education is still limited: there is little teaching of astronomy at secondary level and, in university physics courses, it is a specialisation.

The types of discourse which transpose this knowledge from the source community may be identified in terms of different types of publication, e.g.:

- “literature” for young people;
- magazines specialising in astronomy or high-brow generalist magazines aimed, for example, at a scientifically cultivated readership;
- the daily press, which reports on events in these fields (“discoveries” in knowledge of space, description of astronomical phenomena such as eclipses, the passing of comets etc);
- school textbooks: space science is part of the lower and upper secondary curriculum, although it may be considered as having only a small place;
- encyclopaedic works, including the “new” multimedia resources, which are particularly well-suited to the observation disciplines (in the visual sense);
- the texts produced by famous scientists (Hubert Reeves, Stephen Hawking etc) for a general audience.

Clearly, therefore, what we have here is not a single discourse genre (the discourse of astronomy, physics, art etc), but a multitude of discourse genres, many of which are already or can be involved in the teaching of subjects.

With a view to plurilingual and intercultural education, school’s role is to widen the range of discourse genres to which learners have access, which we will call their discursive repertoire (which may include discourse genres in different languages). Building on their spontaneous notions and their experience of ordinary everyday communication, scientific subjects seek to offer them the opportunity to experience discourse genres which are not part of their repertoire, to understand their workings and to appropriate some of them (reception or production), thus creating the conditions for appropriation of the knowledge imparted by them and of the mode of construction of that knowledge as it is represented in the texts. The function performed by this increased range of discursive repertoires is to enable learners to discover scientific cultures in order to guide them towards these specific communities of practice, through mastery of the varied discourse genres associated with them.

2. General forms of classroom communication

Classes are also communities employing forms of communication which can be described in terms of texts and discourse genres, irrespective of the subjects taught. There are many different genres of classroom discourse: teachers' and learners' presentations, teacher-led or learner-led discussions and debates. Discussion may focus on problem exploring or problem solving, presentation may focus on information or persuasion. Such forms of classroom discourse can be seriously planned and carried out by teacher and learners; they may "break out" spontaneously as well. In educational discourse the relationships are those between teacher and learners, or between learners. Teacher and learners position themselves and each other in their discourse, and in educational discourse the process of meaning making is a process of learning, of transmitting or constructing knowledge.

The following description of classroom discourse genres presents what may be considered to be basic formats of teaching/learning discourses, formats of discourse in which the (assumed) learning by the learners is organised. It is relatively independent of the subjects taught and topics addressed. It will not be entirely problem-free because it is not always easy to distinguish between formats. These classroom discourses are often fairly hybrid and quickly change from one format to another. They will be classified according to their organisational format and their function in the learning process. Two basic formats will be identified: teacher-learner interaction and learner-learner interaction.

2.1 Teacher-learner interaction

There are two formats of teacher-learner interaction: "monologic instruction" (where, in the terminology of E Roulet, only one speaker is involved) and "dialogic instruction" (teacher-led discourse, but jointly constructed with the class through interaction)⁵.

2.1.1 Monologic instruction

Monologic instruction appears in two slightly different formats. In the first, the teacher talks during the whole lesson: frontal education. There is no or hardly any learner's contribution to the discourse. This instruction is about what is already known, about what is considered to be valid knowledge that has to be transmitted accurately by the teacher and/or the course book to the learners. The teacher may be modelling how to think, or how to solve a problem. The learners are supposed to listen, their experiences and knowledge are not important. Learning is above all being able to reproduce the knowledge transmitted by the teacher. The teacher talk is structured by a subject-specific list of topics and argumentation. Classroom discussion can be seen as a waste of time. In the second, the teacher is mixing his talk with questions to the learners. He asks questions to which he already knows the answers. He selects which learners are questioned. He does not accept possible learners' initiatives to change the topic. The most important intention is to transmit information to the learners. His way of questioning often leads to a three-part exchange called the IRE sequence: question by the teacher; response by the learner; evaluation of the response by the teacher (according to Sinclair and Coulthard's "classic" model⁶). Although, viewed superficially, this format of interaction could be perceived as a dialogue, it is in fact a monologue. The questioning mainly aims at continuing the line of argumentation and reasoning by the teacher, but often the questions appear to be mutually unrelated, at least in the perception of the learners. The questions demand small, reproductive answers, in one or two words by the learners. They become acculturated not only in the discourse community of the subject, but

⁵ The distinction between monologic and dialogic instruction is a distinction between two 'archetypes'. In classroom reality those two types many times are to be seen in one and the same lesson. Teachers can switch, according to the situation. See also 2.3.

⁶ The IRE model (Initiation by the teacher – Response by the learners – Evaluation by the teacher) was presented by J. M. H. Sinclair & R. M. Coulthard (1975): *Towards an analysis of discourse: The English used by teachers and pupils*, Oxford University Press, Oxford.

also in the discourse community of the school. They learn that usually only one answer or a limited range of answers is acceptable. The learners' answers are most of the time only elliptical sentence fragments; they try to guess what the teacher has in mind. The teacher avoids controversial topics. He uses the "dialogue" to control the classroom situation.

Often teachers choose the frontal situation or the IRE format thinking that their learners might learn from an inspiring talk, or because it is a way to control the classroom. Sometimes they opt especially for the IRE format because they feel caught between contradictory demands: transmitting knowledge in an efficient way and at the same time challenging their learners to actively participate in the lesson. Another reason might be that teachers feel obliged to prepare learners for tests in which also just one answer is considered to be the only valid one.

2.1.2 Dialogic instruction

In dialogic instruction the objective of the lesson is not to transmit knowledge, but to "transform understandings, to negotiate on the meaning of the topics of conversation".

Dialogic instruction is characterised by more conversational turns. Learners select themselves or others in speech turns, speech topics are chosen by all participants, the teacher primarily frames and facilitates the conversation. The dialogue stimulates teachers and learners alike to contribute their ideas to a discussion in which their understandings evolve, there is a more symmetrical or reciprocal division of roles: teacher and learners both learn and teach, e.g. explain, question, hypothesise.

There are fewer teacher questions and more learners' question than in the IRE format and the questions are different. There are genuine questions or authentic questions, questions without fixed answers, as opposed to reproduction questions. The questions in dialogic instruction tend to diagnose learning problems, or to stimulate the learners' thinking process. They try to provoke learner ideas, creating an ambiance in which knowledge is something everybody can create and possess; they stimulate learners' ownership. There is a substantive engagement by teacher and learners.

The feedback by the teacher on questions and answers by the learners is not an evaluation in terms of "true" or "false" statements. The teacher evaluates the learner's contribution by using it as a worthy contribution to the dialogue at hand. He does this by verbally noting the importance of a learner's response in shaping a new understanding, by certifying the learner's response and by incorporating the response in the discourse of the class. Thus the feedback by the teacher, and probably also by learners, shows a high level evaluation and uptake, which can stimulate an open learning climate. Linguistic characteristics in teachers' and learners' language indicate whether they employ reasoning and argumentation in their questioning and answering. Reasoning and argumentation require the use of co-coordinating conjunctions like "but", "because", "so", and subordinating conjunctions like "when", "although", "if"... Teachers' and learners' thinking is thus made visible.

A hidden dimension in this practice is that knowledge is not given but (co-) constructed (collectively) by language use, by negotiating; that learning demands active participation by the learners, that their voices are important, as are their experiences, values and perspectives, including different social-cultural groups, origins, genders and languages.

2.2 Learner-learner interaction

Learner-learner interaction varies along two lines: the number of learners (small or larger groups) and the assignments set for the learners' work. Learners' activities can be tightly or weakly guided by the assignment, and tightly or weakly controlled by the teacher. But in any case learner-learner interaction develops different kinds of talk. Also the typology of learner-

learner interaction is problematic, because of overlapping, hybridism, changing. Nevertheless we distinguish the following types:

- **Socio-cultural talk.** This discourse is distinguished from other ones because of the topic under discussion. Learner's talk together about almost everything that has nothing to do with educational tasks: family, friends, weekends, etc. The objective of such talk is to establish or maintain social relationships. Sometimes such relationships are a basis for more education-related talk. There might be some learning that can be characterised as incidental, but it is not learning that is directly related to educational objectives.
- **Procedural talk:** learners talk about how to carry out the assignment set for their work. Sometimes there is some learning that might lead to procedural knowledge: how to do things, especially when they argue for possible actions, proposing solutions. They learn about setting up experiments, carrying out inquiries.
- **Instrumental talk:** learners' talk is mainly directed towards fulfilling their task as efficiently as possible (usually as quickly as possible). The question in the assignment e.g. needs an answer. So e.g. learners note an answer, even if they doubt if it is the correct answer, because the teacher expects and the task requires an answer.
- **Disputational talk:** learners disagree, draw their own conclusions, make their own individual decisions. There is little or no co-operation. Tensions or even conflicts between learners appear to be counter-productive for their learning.
- **Cumulative talk:** learners build positively but uncritically on what the other one has said, there is no construction, only accumulation of information.
- **Pedagogical talk:** learners take over the role of the teacher, explaining the topic, the content and the task to each other. The "learner teacher" as well as the learners may learn from this talk. The learner teacher because he/she has to explain, to demonstrate, in short he/she is productively dealing with the content of the lessons: verbalisation can lead to elaboration of cognitive processes, to reflection, awareness, expansion of knowledge. The other learners may learn because of the individually directed explanation.
- **Exploratory talk:** learners discuss and argue about some school subject related topic, using or exploring subject specific concepts. They explain these to each other, supply information, identifying problems and applications. They discuss and evaluate information and interpretations, generate ideas, suggest hypotheses, develop criteria. They listen and try to understand by asking and answering questions. Possible tensions or even conflicts between learners appear to be productive for their learning.

A curriculum analysis of several subject areas in four European countries (England, Germany, Norway, Czech Republic; Vollmer 2007, Thürmann 2008, Vollmer et al. 2008) shows that there seems to be a limited set of *basic language or discourse functions* which are repeatedly mentioned and which seem to represent (or at least relate to) something like basic structures of content and procedural knowledge. These functions are conventionally stated, sometimes more, sometimes less explicitly; they are understood and shared by the respective discourse communities and constitute a link between the pedagogical approaches of dealing with text types and genres and the academic ways of thinking, writing and speaking. These functions reflect the logic of experience and knowledge construction and thus the basic patterns of cognition. At the same time they provide a framework for "translating" those cognitions into socio-semiotic reality, into language and discourse. In that sense discourse functions are both cognitive and linguistic in nature and come very close to the concept of thinking skills.

All these interaction activities, except in the case of monologic instruction, which is the teacher's sole responsibility, bring into play linguistic resources which have to be mastered by learners whose first language is the language of schooling. They are not very different from ordinary exchanges, but they do, however, comprise a metalinguistic dimension

(questioning about words and not about what they refer to) which is a specific feature of many discourse genres and which requires specific management in teaching (especially with young learners). The following points should be noted:

- management of interaction: speech initiative, management of speaking turns, interruptions, changing the subject, etc
- the form of closed questions (e.g. calling for a *yes/no* answer)
- the form of open questions (*who? how? where?* etc)
- the form of replies which do not necessarily have to follow the syntax of the written language (e.g. utterances without verbs)
- expression of the fact that one has understood or not
- interpretation of assessments of what has just been said (*true, easy, clear* etc)
- ways of reformulating, being more specific, asking someone to reformulate etc
- expression of certainty, doubt, restriction, hesitation etc
- [...]

However, the ability to classify, describe, deduce, explain, demonstrate etc uses linguistic resources with which learners may be familiar, but as it is not strictly linguistic in nature, but at once linguistic and cognitive (varying according to the epistemology of the subjects taught), it requires explicit teaching.

2.3 Formats of communication and learning

There is still discussion about the function of the different formats of classroom communication in learning. And, from this pedagogical standpoint, there are different national traditions. There may be a tendency to prefer lecture-type instruction, which should have the advantage of presenting knowledge in an organised and coherent manner, ensuring that it is intelligible to the people at whom it is aimed. But it is therefore mainly the teacher who speaks, and there are “silent” classes where the learners’ main task is to understand and note. It is the lecture format which predominates, for example, in higher education⁷. This “frontal” teaching seeks to adapt the knowledge transmitted to the particular audience and allows for quality control: teacher’s flow, clarity of articulation, relevance of “illustrations”, clarity of the overall structure and its component parts, clear marking of links between sections, explanatory value of examples etc. This extensively monologic format for transmitting knowledge tends to be contrasted with formats of classroom communication which favour the (re)construction of knowledge by learners as the preferred means of appropriating knowledge. A perspective of this type emphasises the fact that learning is above all a social and cultural process and that it is therefore achieved, in the classroom, in and through interaction with other learners and with the teacher, where shared knowledge is jointly constructed. But this format does not facilitate automatic acquisition because not all classroom interaction is in itself conducive to the acquisition of scientific knowledge: it is not enough for learners to communicate verbally in “talkative” classes, because what is important is the quality of interaction, which lies in its ability to guide learners from one form of knowledge to another: from ordinary notions to scientifically proven knowledge, from an understanding of concepts to their controlled, reflective implementation in calculations, observations, analyses, technical systems, problem solving etc. Communication within a field of knowledge (scientific, artistic or technical) therefore involves teaching that does not put the emphasis solely on the transmission of knowledge and its applications and uses in given contexts, or on procedural competences, but also on its significance from an epistemological and social standpoint, particularly as regards its implications for the life of the community (e.g. nuclear power, sustainable development, pollution etc).

The formats of classroom communication therefore dictate the concrete strategies used for the teaching of subjects, as well as being “verbal applications” of those strategies.

⁷ But lectures are usually supplemented by practical sessions.

3. Forms of communication in the teaching of scientific, artistic and technical subjects

The teaching of school subjects in which language is not the central focus of teaching is organised on the basis of the formats of communication described above, but it also brings into play or relies on other discourse genres. It may be viewed as the setting for a particularly complex confluence of discourse genres (scientific or not) which establish the classroom as a community of practice because, in principle, the following are shared there:

- a perception, more clearly defined in some cases than others, between learners (who are in the process of acquiring some of these) and teachers (whose perception of them is not always clearly defined), of the forms which texts should take in order to be regarded as of good pedagogical quality and as a potential learning space;
- ways of switching between discourse genres.

In addition to the ordinary formats (exchanges with learners or between them in practical activities, group work etc, see 2.1.2. and 2.2.), the following are directly present or used in transposed forms:

- discourse genres related to the creation and, above all, the disclosure of knowledge (see 1.4.), which appear mainly in textbooks or the teacher's monologic presentation (exposition, description, explanation etc);
- "non-scientific" discourse genres (e.g. in history: asking learners to imagine letters from various participants in the fall of the Berlin Wall or the fall of Constantinople in 1453);
- oral or written discourse genres "invented" by school which are not used in social communication in the outside world.

The last-mentioned are particularly important in teaching because, unlike the others, their conventions for writing and presentation and for representation of knowledge cannot necessarily be identified by learners from their pre-existing repertoire of discourse genres. Moreover, they perform varied functions in teaching/learning: some prepare for socially relevant discourse genres: a pupil's report to the class could be regarded as training for giving a presentation in a professional context; the literary or historical dissertation (as it is understood in the French education system) is similar to the corresponding scientific output (article, paper). Others form part of tasks which constitute teaching activities: report on experiments in physics as part of practical work, findings from observation and analysis of documents (in geology, geography, history etc). Lastly, others, which are mainly written and play an important role in knowledge assessment, are less clearly defined, such as the *essay* (in the British education system), the *rédaction* (in the French system), or the *tema* (in the Italian system) because they were created by school for the teaching of the language as a subject.

Such is the diversity of discourse genres in a given subject that it is not always possible to define the expected textual and scientific competences: it is possible, for example, to confine oneself to written textual forms that are unclearly defined and therefore difficult to describe. Learners cannot be referred to precise "models" for producing them, which tends to hinder the teaching of them and blur their assessment. It has already been stressed that:

the fact that awareness-raising activities in general, and those of a scientific nature in particular, may lead children to produce different texts from those they produce at other times in their school career, in or out of school, is accepted by most teachers, more explicitly in some cases than others. But the recognition of this fact is not necessarily accompanied by a very clear awareness of the differences exhibited by these texts in relation to so-called "free" texts or those generated by other school

subjects, and of the role they may play in relation to the awareness-raising activity itself. [...] Hence, both in the classroom and in reports on activities carried out by teachers or by various observers, one often hears references to ‘awareness-raising texts’ or ‘scientific texts’, or, more cautiously, ‘science-oriented texts’, without having a clear idea of what these terms actually cover.⁸

For each subject it will be important to:

- *specify the nature of the linguistic quality of the monologic teaching genre;*
- *assign precise scientific goals to oral interaction in the classroom;*
- *catalogue the other discourse genres present in teaching;*
- *specify their uses (comprehension, production, rewriting etc);*
- *describe as clearly as possible the form of the oral and written texts expected from learners, insofar as they belong to a discourse genre which is itself clearly identified;*
- *differentiate texts used for the appropriation of knowledge from those used for assessment of the results of learning: they are not necessarily identical or drawn up in the same way;*
- *consider above all the relevance of these texts to the learning goals in the particular subject: what is the relevance to learning of writing and memorising “history summaries” (summaries of chapters in the textbook)?*

Clearly, then, defining the scientific knowledge and competences to be acquired means defining the interactions to be established in the classroom and defining the texts (in particular, written texts) to be produced as a means of appropriating knowledge. Is it a question of imparting information (how the human digestive system works, what led to the diversity of animal species, etc) in order to develop learners’ awareness of the world, or also enabling them to perceive the nature of the scientific approach and the knowledge-building process? Both these major goals can be pursued jointly, but they definitely involve the use of distinct discourse genres.

In any event, the “language issue” in the teaching of school subjects should not be considered, as is often the case, as being a kind of collective responsibility of all teachers, who must work together everywhere to ensure the proper use of the language of schooling. As we have shown, it is central to the transmission and acquisition of knowledge and, in this respect, constitutes a specific responsibility of subject teachers, and not an adjunct to the teaching of the language as a subject in its own right.

4. Discourse competences for learning in scientific, artistic and technical subjects

We will now endeavour to give concrete substance to this language teaching. Considering that subject teachers do not need to be linguists but that recourse to certain linguistic categories is necessary to identify these tasks, we cannot emphasise enough the importance of training/awareness-raising activities for this purpose and the participation of specialists in discourse analysis in developing the relevant programmes.

It is not the intention of this text to produce descriptors comparable to those of the *Common European Framework of Reference for Languages* (CEFR) or inventories similar to those of the *Reference Level Descriptions for languages* (RLD)⁹, as a “complement” to them. That is outside its scope because verbal communication in the teaching of subjects depends on the

⁸ [Collective] (1983): *Eveil scientifique et modes de communication, Recherches pédagogiques* 117, Institut national de la recherche pédagogique (INRP), p. 77.

⁹ www.coe.int/lang

actual nature of each subject and the teaching methods adopted, and hence on educational cultures and traditions which are far from uniform. Its description depends also on the gradation of the knowledge offered over the course of the curriculum (by year, by stage of education etc), which varies greatly in Europe, as well as on the nature of the main language of schooling and its specific characteristics (phonetic, morphological, lexical, syntactic, textual). Consequently, we will not propose a set of common descriptors, but a shared approach (rather like a protocol), as already outlined in connection with several earlier points in this text, which should make it possible to reach agreement on the language dimensions of subject syllabuses.

4.1 Cognitive genesis: an intertextual path

The acquisition of scientific competences and knowledge may also be seen as a progression from mastery and use of some forms of discourse to others: the genre repertoire of learners develops through transformation of existing forms into other forms, along an intertextual path, in the same way (but this is only an analogy) as one moves from spontaneous, common-sense knowledge to verified, generalisable knowledge.

Learners' spontaneous knowledge and perceptions (which have concrete dimensions and are derived from immediate experience) are the starting point for progressing to abstract categorisations and generalisations that are independent of the observation context. These initial perceptions and the words and textual forms used to express them will provide the teacher with bridges for moving towards conceptualisation of these immediate experiences, through a system of new concepts, terms, meanings and symbols.

Learners' spontaneous activities and beliefs, triggered by their curiosity or their capacity for surprise, easily provide them with reporting material. However, in practical science-oriented activities (assignment, project, early learning activity in primary education), conceptualisation itself, as a form of problem solving involving the use of invariants (size, properties, relationships etc), will bring into play intermediate verbal outputs: notes, rough drafts, exchanges of opinions and theories between learners, and non-verbal traces (drawings, diagrams etc). At best, they will be able to take on a "mixed" form of discourse in which there will still be a close link and little difference between learners' beliefs and knowledge-building processes (theory, experimental/empirical verification). It is a long way from a learner's account of a spontaneous experiment to a scientific report by a learner on an experiment expressing general relationships independent of the subject and concrete conditions of observation. However, it is this path, which all learners must tread, which needs to be marked out by focusing particular attention on these mixed or unclearly defined textual forms, insofar as they are a medium for knowledge. Below is an attempted typology based on the productions of learners in primary education.

Knowledge building at school may also be seen as a complex intertextual process in which it is the role of teaching to serve as guide. This process has several main thrusts:

- *from collective knowledge building (in interaction with peers or the teacher) to individual appropriation of knowledge, hence with the ability to feed back and reproduce that knowledge in a coherent textual form;*
- *from oral forms (with frequent rephrasing) to written forms, from which the hesitations and successive approximations have been removed, via provisional, exploratory written forms (rough drafts, notes, outlines etc);*
- *from reception/comprehension to production (model-based teaching);*
- *from "spontaneous", improvised texts in ordinary communication to texts conforming to explicitly defined conventions based partly on the nature of each school subject, via a stage of reproduction/reprocessing/reformulation (see above: model-based teaching);*

- from personal accounts of experience to texts (e.g. reports or problem-solving) of a scientific nature;
- from textual forms used for learning to those used to assess learners (mainly written forms).

These should help give structure to scientific, artistic and technical syllabuses where their linguistic dimensions are concerned.

This description of teaching/learning processes as transformation of the corresponding knowledge and texts reminds us that, in plurilingual and intercultural education, the exposure of learners (in clearly identified teaching sequences) to a range of discourse genres and languages and experience of receiving, handling, reformulating and producing them is a precondition for learning. This experience of switching and mixing discourse genres is essential if learners are to adapt to the diversity of languages and cultures of contemporary European societies and the diversity of forms of knowledge in circulation, which requires great critical vigilance on the part of citizens.

4.2 The successive forms of language competences in school subjects

The gradual building of language competences facilitating the appropriation and use of knowledge requires learners to be given an awareness of discourse genres and the verbal means to increase their repertoire of discourse genres:

- textual forms of genres used in ordinary communication (conversation, personal account, personal opinion, expression of feelings)
- textual forms of intermediate and mediating “genres”, which are not necessarily present in actual social communication or are ambivalent (used in ordinary and scientific communication, but in different ways)
- textual forms corresponding to scientific genres (those of scientific communities), parascientific genres (those of university teaching) or wider dissemination genres, forms which will have been chosen as learning models and teaching goals.

4.2.1 Taking the I-here-now out of learners’ utterances

The first general form of transformation of learners’ discourses is the progression from the personal account, talking about oneself, to a more objective discursive regime which is independent of the immediate context. These linguistic forms do not necessarily give rise to complete texts, but they can be used in each utterance. They tend to give rise to utterances not centred on the individual (*I/you*) and the context (*here/now*) but possessing a form of generality which is independent of those parameters. There are some ordinary genres which have this appearance (proverbs, general truths, maxims etc), but they are still a long way from what is expected of a scientific utterance¹⁰. This may be characterised in the first instance as meeting requirements such as the production of utterances or texts that are *succinct, precise, explicit, complex, structured, objective, unemotional, unambiguous* etc. It is a form of utterance that can be achieved in texts belonging to different discourse genres and does not constitute one in its own right. In the school context, to achieve output of this kind, learners must master:

¹⁰ The term *academic discourse* is also used, especially in the English-language literature, where *cognitive academic language proficiency* tends to be contrasted with basic *interpersonal communication skills*. See Cummins J. (1979): “Linguistic independence and the educational development of bilingual children”, *Review of Educational Research* 49, p. 222-251 and (1991) “Conversational and Academic Language Proficiency” in Hulstijn J & Matter J.F. (eds), *Reading in two languages*. AILA-Review 8, p. 75-89.

- the corresponding terminology (*precipitation vs. rain*) and its use as such: repetition of the same term should therefore not be regarded as a stylistic shortcoming but as a precondition for clarity and consistency;
- personal pronouns (*The eagle is a bird of prey. It..*) or generic terms (*element, substance, problem etc*);
- all objective forms of quantification and location in time (beginning, interval, frequency, duration etc), i.e. which are not assessed or identified in relation to the person speaking (*It's too hot = for me*);
- links stressing enumerative, chronological, "logical" relationships etc, particularly in the form of co-ordinating and subordinating conjunctions in places where, in oral discourse, juxtaposition may be enough (*He was late. I left.*);
- ways of expressing certainty (present simple (*Water boils at 100 degrees*), doubt, possibility, a restriction etc);
- the use of conventional assessments (*significant results, interesting findings, plausible hypotheses etc*);
- [...]

This set of resources should enable learners to express observations and relationships otherwise than in a subjective manner. It is not really sufficient yet for the construction of texts as it is situated at the level of the attitude of the person "speaking" (who is not "speaking" in his or her own name), and does not constitute a text model corresponding to an identified discourse genre. Clearly, however, it constitutes material that can be used for structured, even short, texts oriented towards a conclusion, a finding, a deduction or a result.

4.2.2 Text sequences representing cognitive operations

At a subsequent stage, the teaching goal could be the ability to produce homogeneous (oral or written) texts representing in words a specific cognitive ability, such as comparing, deducing, demonstrating or defining. These textual elements do not transcribe actual intellectual operations (which are not observable), but report them.

Discourse functions?

These may be present in interactive or expository oral discourse insofar as they are not necessarily intended to take the form of texts belonging to identified discourse functions (especially in oral interaction between learners). These discursive representations of cognitive activities have been used for a long time (particularly under the influence of the work of M.A.K. Halliday and his notion of *function*) in textual linguistics or discourse analysis: they have been given many different names (there is no need to discuss them all here) such as *function*, *text type* (narration, description, instruction, argumentation etc), *discursive operations* (*Threshold Level*, 1976), *cognitive processes* (representing, interpreting, comparing, justifying etc), *language operations* etc). What these terms have in common is that they seek to link knowledge-building processes with a verbal/textual form.

Curriculum analysis of several subject areas in four European countries (the United Kingdom, Germany, Norway, the Czech Republic)¹¹ shows that there seems to be a limited set of *discourse functions* which are repeatedly mentioned and which seem to represent something like basic structures of content and procedural knowledge. These functions are conventionalised, sometimes more, sometimes less explicitly so; they are understood and

¹¹ Thürmann E.: *Educational Standards and the language of schooling at the end of compulsory education. Analysis of curricular documents issued by the German Länder*. Strasbourg: Council of Europe. (Unpublished ms.);
 - Vollmer H. (dir.) (2007). *Language and Communication in the Teaching and Learning of Science in Secondary Schools*. Strasbourg: Council of Europe. (www.coe.int/lang → Resources/Publications → Languages of Schooling → Thematic Studies 2007 → 2 - Science);
 - Vollmer H., Thürmann E., Arnold C., Hammann M. & Ohm, U.: *Elements of a Framework for Describing the Language of Schooling in Subject-Specific Contexts: A German Perspective*. Strasbourg: Council of Europe (draft version, to be published in 2011)

shared by the respective discourse communities and constitute a link between the pedagogical approaches of dealing with text and genres and the academic ways of thinking, writing and speaking. These functions reflect the logic of experience and knowledge construction and thus the basic patterns of cognition. At the same time they provide a framework for “translating” those cognitions into socio-semiotic reality, into language and discourse. In that sense discourse functions are both cognitive and linguistic in nature and come very close to the concept of thinking skills.

Inventories, typologies, a model

Establishing a comprehensive typology of these discourse functions is a complex task because their definition is totally dependent on the ordinary lexicon (e.g.: *résumer, contracter, réduire* in French). It is possible to agree more or less on deliberately loosely structured inventories such as:

- *presenting (showing, identifying, defining etc)*
- *describing or representing (enumerating, identifying the constituent elements etc)*
- *characterising (comparing, assessing, assigning a quality/quantity/property)*
- *situating an action or process in time and space*
- *representing an action or event in time*
- *doing, acting*
- *explaining, arguing*
- *summarising*
- *[...]*

It is also possible to construct more elaborate models consisting of macro-functions, e.g. EXPLORING - NAMING - DESCRIBING – NARRATING – REPORTING – EXPLAINING – EVALUATING – ARGUING - REFLECTING - SIMULATING

which can be divided into lower-level functions, as follows:

LABELLING – DEFINING – POINTING (at, out) – SPECIFYING (details) – COMPARING – CONTRASTING – RELATING – JUDGING – APPRECIATING – POSITIONING, etc.¹²

Lastly, one can even produce a model (in this case based on B Mohan’s *knowledge framework*¹³) to develop a syllabus for English as a second language as the language of teaching¹⁴ on the basis of functions:

Theoretical/General		
Classification	Principles	Evaluation
Sample thinking skills:	Sample thinking skills:	Sample thinking skills:
Classifying Identifying Understanding Applying or developing concepts	Establishing hypotheses Interpreting data Drawing conclusions	Evaluating Ranking Judging Appreciating
Sample language:	Sample language:	Sample language:
Verb categories Verbs of possession: <i>have</i> comparison: <i>more than – taller than</i>	Cause/reason: <i>is due to</i> Condition & contrast: <i>if there is</i> Prediction: <i>probably</i>	Describing emotions: <i>like, dislike, satisfactory</i> Evaluation adjectives: <i>good, right/wrong</i>

¹² See Vollmer et al. 2008; see also Vollmer H. J. & Thürmann, E. (2010): „Zur Sprachlichkeit des Fachlernens: Modellierung eines Referenzrahmens für Deutsch als Zweitsprache“ dans Ahrenholz B. (ed.): *Fachunterricht und Deutsch als Zweitsprache*. Tübingen: Narr, p. 107-132

¹³ Mohan B. (1986): *Language and content*, Addison-Wesley, Reading, MA.

¹⁴ Beckett G., H. Gonzalez, V. & Schwartz H. (2004): “Content-based Writing Curriculum: A Language Socialization Model”, *NABE Journal of Research and Practice* 2:1, p. 161-75.

Classification: <i>include, place under</i>	Generalization & explanation: <i>completely</i>	Verbs of volition: <i>prefer, had rather</i>
Sample thinking skills:	Sample thinking skills:	Sample thinking skills:
Observing Identifying Comparing Contrasting	Arranging events in order Following directions Predicting order	Selecting Generating solutions Solving problems Identifying issues
Sample language:	Sample language:	Sample language:
Stative verbs: <i>believe, feel</i> Relative clauses: <i>who, what, how</i> Prepositions of place: <i>between, under</i>	Logical & chronological connectors: <i>during, next, finally</i> Prepositions of space and time: <i>at, around, about, towards</i>	Modals: <i>can, will, must, should</i> Request/offer: <i>I can, I could, Could I</i> Preference: <i>prefer, had rather</i>
Description	Sequence	Choice
Practical/Specific		

But whatever the form adopted (inventory, hierarchical typology, model), determination and specification of the discourse functions to be placed at the centre of learning will depend on the language. They will therefore need to be established language by language on the basis of the ordinary lexicon available, care being taken to ensure that their names are directly accessible to learners and that their definition as textual forms and the nature of the cognitive tasks expected are clear.

Transversality

One important requirement in the specification of these discourse functions is especially that they should, as far as possible, be common to all the subjects taught (including the language of schooling taught as a subject), in order to guarantee the transversality that is essential in education. This is all the more necessary in that discourse genres can vary from one subject to another depending on the area of knowledge concerned (social science, experimental science, mathematics, literary criticism etc), even if their position in the discourse typology may lead them to adopt comparable forms (research discourse, doctoral thesis, encyclopaedia entry, school textbook etc). But, with the occasional exception, discourse functions are not discourse genres: they are components of them: as such, they are given variable linear orderings and formulations, and it is these which lend each discourse function its specific language identity. It is therefore these text sequences which may appear in isolation in oral interaction or in provisional, exploratory texts, which are the most visible area of convergence for teaching activities which take them as their object in different subjects. Significantly, it is precisely these discourse functions (referred to in this case as *cognitive/discursive operations*) which are taken as the basis for assessments of plurilingual competence:

[...] [the checks] could focus on the strategies deployed in exercising communication skills, either global (e.g. written reception) or metalinguistic (ability to interpret unknown terms in context, formulate a pattern from observation of a random text body), or on more limited shared elements, such as oral and written expression of discourse/cognitive operations (e.g. the ability to define, quantify, compare, etc.) common to the discourse genres concerned.¹⁵

The learning of some of these sequences in the context of classroom interaction or learning tasks brings more clearly into play the ability to construct coherent texts (see 4.2.1.), which involves planning, execution, checking and revision strategies etc. This learning should take

¹⁵ (2010): *Guide for the development and implementation of curricula for plurilingual and intercultural education*, Language Policy Division, Council of Europe, chapter 2.7. Our underlining.

learners from personal narration to varied forms of verbalisation of the cognitive activities that constitute *scientific literacy*.

It is impossible to describe here the language resources needed for “proper” performance of all the discourse functions mentioned. Reference can be made to the existing descriptions in each language or analysts of scientific discourse could be asked to produce such descriptions. Reference can always usefully be made to the *Threshold Levels* or to the *Reference Level Descriptions* for particular languages, which may include entries by discursive function. This approach is exemplified by two texts of the *Platform of Resources and References for Plurilingual and Intercultural Education*¹⁶:

- **History:** *An approach with points of reference – Items for a description of linguistic competence in the language of schooling necessary for teaching/learning history (end of obligatory education)*
- **Science:** *An approach with points of reference - Items for a description of linguistic competence in the language of schooling necessary for teaching/learning science (end of obligatory education).*

4.2.3 Forms of scientific discourse genres in the classroom

Subject teaching brings into play discourse genres which inform verbal exchanges in the classroom. Some are focused on transmission, such as the teacher’s monologic discourse or the relevant textbook. At any rate, they do not belong to the discourse of the scientific community concerned but pertain to forms of dissemination/transposition of knowledge regarded as established.

The foreseeability of knowledge transmission discourses

What matters more than anything else, therefore, is their “legibility” to their recipients. It may be considered that this is culturally variable and also depends on learners’ cognitive development. The quality criteria cannot, therefore, be defined a priori, but presuppose empirical analyses based on teachers’ productions or the school textbook corpus. Layout and iconography are known to play a major role in this. What might be more important is their division into sections (the paragraph in written material) and their foreseeable organisation through use of recurrent patterns, such as:

- link with the previous paragraph
- theme/assertion/thesis/main information etc
- justification
- examples...

For example, this paragraph from a text aimed at a general readership follows an expected pattern¹⁷ and its links are very visible:

The text concerns the discovery of new foods in the 16th and 17th centuries
In some fields, such as that of fruit and vegetables [announcement of the paragraph structure], *a full-scale revolution took place during this period* [thesis]. *First of all, a certain number of vegetables were brought in from Italy. Some of these were old acquaintances which had been considerably improved by that country’s farmers* [1st specification of the thesis; level 1 example: vegetables]: *these included asparagus, artichoke, sorrel, beetroot, cardoon, cauliflower and peas* [level 2 examples]. *At the same time, new techniques were introduced in an attempt to improve fruits indigenous or long acclimatised to France* [2nd specification of the thesis; level 1 example: fruit]: *pears, apples, peaches, plums, melons*

¹⁶ www.coe.int/lang → Platform of Resources and References → Box “Language(s) in other subjects”

¹⁷ François M. (ed.) (1972): *La France et les Français, [L’alimentation]*, Encyclopédie de la Pléiade, Gallimard, Paris.

and strawberries, which, by dint of patient selection, became very different from their rustic relatives [level 2 examples]. Lastly, efforts were made to acclimatise certain plants newly arrived from America [3rd specification of the thesis; level 2 example: vegetables], such as the Jerusalem artichoke, peppers and, especially, tomatoes and beans [level 2 examples].

The teacher's monologic discourse and the text of textbooks may be expected to exhibit organisational features of this kind, which, in theory, facilitate their reception by learners, without losing sight of the fact that exposure to texts structured in this way can help them in their own oral and written productions. As already stressed, it is essential that we base ourselves on the ideas which the recipients have of the simplicity of access to texts either through direct surveys among them or by analysing the characteristics of oral and written texts which they regard as "simple", in each language/educational/cultural context.

The characteristics of parascientific or (pre)scientific discourse genres in the classroom

In school teaching, the language tasks expected of learners rarely go so far as the production of texts proper, although this cannot be ruled out, particularly in upper secondary education. These are rarely texts of the kind actually used in scientific communities, but genres created for teaching which come close to them in some respects. They do not adopt their norms, but exhibit specific norms which define their proper form and quality, unlike isolated text sequences performing discursive functions. These scientific texts of school culture can be very varied within the same educational culture and between them: we would need to have an inventory of these textual forms in order to get a better grasp of their characteristics: report (on practical laboratory exercises), commentary on data (figures, non-verbal data, such as a photo of a Greek vase, map showing the distribution of a plant species etc), written solution to a problem (maths, physics etc), oral presentation (on a topic, a work etc), essay (discussing an opinion, an interpretation etc).

It was noted above that these discourse genres have no exact equivalents in social/scientific communication; this may make it problematical to specify their production norms and their assessment criteria, which may be based on perceptions which are considered to be shared but which remain unclearly defined and, especially, defined a contrario. This relative lack of definition of the textual products expected may function as a "hidden curriculum" and prove contrary to fairness.

The only solution is to describe these discourse genres as accurately as possible in order to render the teaching of them transparent. Obviously, they all share a certain form of distancing (see 4.2.1.) and some of their developments are similar or identical to the forms, already experimented with, which are given to discourse functions in brief, isolated text sequences (see 4.2.2.).

We will therefore confine ourselves to an indication of the nature of the "conventions" which lead texts belonging to the same discourse genre to resemble one another while always being unique.

It should first be noted that some discourse genres are subject to strict constraints and the corresponding texts vary only to a small extent. This applies to mathematical problem-solving genres. Other discourse genres present fewer, or less marked, similarities. The alternative forms, "equivalent" in a given respect to the corresponding texts, are diversified; they leave the writer greater latitude (the development of sentences or paragraphs becomes less foreseeable) or concern specific textual "loci", such as the introduction of quotations in the text. Lastly, other school discourse genres are intended to produce texts which, to a great extent, are unforeseeable in terms of their organisation or the verbal material employed: they thus offer scope for learners' verbal creativity.

In addition to these organisational forms which vary from one genre to another, it is generally agreed that the similarities of discourse which are perceptible from one text to another concern their linear structure or the way they are set out, and their linguistic forms in the strict sense.

Structural similarities may be observed in relation to fixed points such as the beginning and end of texts or textual patterns (more or less fixed succession of elements). For example, in the case of articles for specialist scientific journals, the following structure, explicitly defined by the drafting committees of international journals, is expected: problem area, literature existing on the subject and critical appraisal of it, hypotheses, experimental setup, results, criticism of the results, knowledge acquired (see 1.3.2.). Within these textual elements, whose boundaries can be highlighted (typographically, by means of connectors), discourse consists of an interweaving of elements of discursive functions (giving an example, disproving, commenting, interpreting, inferring, comparing etc) which are more or less fixed and foreseeable (see above).

Formal similarities concern the linguistic “colouring” shared by texts belonging to the same discourse genre. This is given to them in the first instance by a shared lexical core if the texts relate to the same objects of discourse, which is clearly the case with subject-specific discourses. Above and beyond this shared terminology, texts actualising a discourse genre may have recourse to certain linguistic resources, preferred in that they exclude others, which are however perfectly possible in other forms of communication. For example, to assess an element (fact, clue, tangible evidence etc) contributing to the development of historical knowledge, texts in specialist journals use adjectives such as: *significant, striking, disturbing, flimsy, interesting, revealing* etc, and seem to rule out words such as *extraordinary, mysterious* or *fantastic*. Discourse analyses show that the choices offered by the language system are therefore regulated by the discourse genres. They lead all the texts belonging to a discourse genre to have a linguistic “family resemblance”. The settled utterance choices which give them their specific nature concern:

- forms of presence of the speaker: *I, we, impersonal (It seems that...)*, passive form, combination of these possibilities (*It was shown above that...*)...;
- forms of actualisation of the recipient;
- forms of quantification;
- expression of certainty, probability, possibility, obligation;
- expression of value judgments (other than personal);
- verb tenses;
- modalities, in particular the uncertainty (possibility, probability etc), appreciative (subjectively framed assessment: *this point is important*), and deontic (*must, should*) modalities;
- the forms of chains of anaphoric references (*The resignation of... This event... It will be interpreted as...*);
- forms of deduction, demonstration, argument;
- the discursive tone (serious, personal touches etc);
- [...]

To define these choices, reference should be made to the grammars of each language, especially those which address the workings of a language in a form other than that of rules and constraints. As already noted, these essential analyses should be carried out jointly by linguists and subject specialists, teachers of language as a subject and teachers of other subjects.

Concluding remarks

This text will perhaps disappoint readers who were expecting to find handy competence scales broadly common to European education systems and school subjects. Reference instruments of this kind would perhaps need to be developed, although, as the experience of the CEFR has shown, there is a great risk with sets of descriptors of this kind that things will become fixed and standardised. In fact, this was not possible given the context in which this text was produced and, no doubt to a more radical degree, because of the differences between subjects, discourse genres and educational traditions and contexts. The result, therefore, is the outline of an approach and a description of a pedagogical attitude, which is not innovatory if one considers the contributions made to this text by subject teaching theory.

Neither will the reader find any methodological indications regarding specific classroom activities for familiarising learners with these forms of language and discourse required for scientific communication and leading them to identify and understand their value and how they work (syntactically, for example) and assimilate them through systematic reflexive activities. They would need to be built up on the basis of the “grammar teaching methods”¹⁸ developed in the teaching of language as a subject and foreign language teaching. But whatever the techniques adopted (depending on the educational context), they should be implemented from the standpoint that knowledge is not confined to a command of language, and the command of language expected in scientific, artistic and technical communication in the classroom can have a positive impact on the acquisition, use and processing of knowledge.

This focus on language, which is essential for structured subject teaching leading to scientific literacy, should not make us forget, because of the relatively technical issues involved, that school is responsible for providing all learners with solid experience of scientific knowledge: such knowledge is necessary for their understanding of the world and their personal and social life, where ignorance is always a major drawback. It is necessary for the exercise of citizenship in societies where science (but also pseudo-knowledge), the arts (but also the products of the culture industries) and technology (but also unnecessary technicality) are omnipresent and crucial for collective choices. Access to scientific culture and the diversity of knowledge therefore depends on an awareness of languages, discourse genres and texts, which should not be reserved for a few specialists but should be shared as widely as possible, so that all citizens may develop an awareness of them.

¹⁸ See, for example, Beacco J.-C. (2010): *La didactique de la grammaire dans l'enseignement du français et des langues*, coll. *Langues et didactique*, Didier, Paris.