

Describing Reality from the Scientist's Perspective – *Focus on the Scientific and Technical Discourse in English*

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Abstract

Searching for the deep various meanings of reality has long been one of mankind's wishes. Among the various possible perspectives on reality, that of the scientist certainly has different features that are worth exploring. The paper aims to investigate some of the characteristics of scientific and technical communication, as they were presented in the author's course of 'Scientific and Technical Communication in English'. Both the written and spoken patterns of communication in science and technology are investigated. The main means of achieving accuracy, clarity, conciseness and appropriateness in depicting reality scientifically are revisited.

Key words

scientific view of reality, scientific and technical communication, discourse of science and technology, written communication, oral communication

1. Communication in the scientific and technical world – paper focus and theoretical background

In technical universities the requirement for both master and doctoral level students to attend a course focused on developing their soft skills of communicating in the scientific and technical fields of professional activity has proved to be a must. The main course objectives are quite broad, and they comprise not only the intention to support them to upgrade and amend their English language proficiency with a view to applying it in their scientific/technical careers at international standards of quality, but also to enable the learners to better access information in their fields of activity, covering the most relevant aspects of written and oral communication encountered in professional situations. In designing such a CLIL (*Content and Language Integrated Learning*) type of course, the language and content teacher, such as in the case of the present educational context, also the course author, should carefully analyze the literature in the field on the multiple aspects that, seen together,

rebuild the intricate tapestry of reality as understood by a professional in science and engineering. These input sources should be embedded, in both implicit and explicit manners, in the course content, we maintain, in order to contribute to the development of a real scientific perspective on reality of each engineer.

Thus, we agree with a philosopher of science (Randhawa 2006: 3), who points out to the rather wide array of aspects that should be taken into account when a valid answer to the basic question "What is reality?" is attempted at. The perceivers of reality have their own beliefs and ideas influencing them, alongside with the personal experience of facts and, naturally, their results from probing into the 'non-physical probability'.

The literature (Yore, Hand and Florence 2004: 338-349) emphasizes the strong relationship that must exist between the skills of communicating well in written and oral forms within the scientific community, and the chances to 'gain recognition and support' from the members of this community. Moreover, there seems to be full agreement on the fact that 'writing generates insights and clarifies ambiguity in science'. Moreover, as pointed out in an interesting study (Lemke 1990: 1), there are deep 'rhetorical and text semantic similarities' among the various branches of science, as well as certain linguistic features that they have in common, most probably due to the fact that they fulfil relatively similar social functions. Also, most literature recognizes the fact that the main qualities of effective technical communication necessarily include features such as: accuracy, clarity, conciseness and appropriateness (The McGraw-Hill Companies 2001: 1). Hence, a range of aspects that should be emphasized in a course focused on this type of communication and internalized by the learners, e.g. directness of style, clarity of sentence syntax, avoidance of digression and lack of precision in expressing ideas, achieving good coherence and cohesion of the text, including an appropriate use of signposting words/phrases, good choice of register and adapting it to the audience/readership profile a.s.o.

There has been interest in analyzing the 'forms and conventions of scientific discourse' lately (Kinneavy 1980: 170). The literature (Trimble, 1985: 70) encourages 'model-building and practice' as they represent 'powerful strategic technology for discovering and interconnecting scientific concepts'. Similarly, one can find (Kimball 1996: 3) lists of the techniques and functions considered 'modes of

invention' and also steps in the processes of communicating ideas in science. Thus, one can ascendingly construct the final structure by steps which can be summarized as follows: discourse structure – relationships between information items – rhetorical functions – grammatical elements governing functions – lexical components. We fully agree with this complex multi-staged vision, and we have tried to turn our students familiar with these steps in each of the course modules/units, according to the specific topic of each. Another element to be taken into consideration in depicting reality and communicating about it is the use of graphic information and/or visuals, as shown in the literature (Prieto Velasco 2009: 41), as the correct impactful 'grammar for visual images' should be internalized by the scientist-communicator. Therefore, the main components of such a grammar should be found in any course of scientific and technical communication, in our opinion.

2. The '*Scientific and Technical Communication in English*' course – main features reflecting reality

It is precisely with these principles and thoughts in mind that the course analyzed in this study (Catelly 2009: 1-256) was designed. In what follows, a general presentation of the course objectives, context for creation and delivery, as well as the educational context features are briefly given.

The needs of the trainees were carefully analyzed, which was conducive to designing the selection of those components in terms of oral and written communication specific to the field of science and technology which were considered most significant and useful for the future engineering graduates. These components are based on an appropriate linguistic support, as both fluency and accuracy are aimed at.

As the main objective of the course is to ensure that the students, who are in general nonnative speakers of English, should develop a range of soft skills most necessary in their academic and mostly professional activity, at the C1 (Competent User) level in accordance with the Common European Frame of Reference – CEFR, special stress was put on fostering the learners' capacity of using the language efficiently in communication contexts specific to their domains of interest, by means of a blend of theoretical and practical issues, covering: conception, structuring, analyzing, applying and reporting.

The STCE course structure is modular, as can be seen from the syllabus excerpt given in Table 1. There are components that are permanently valid and thus stable, and always useful to the students. However, we have also included components meant to raise the students' awareness of the unavoidable changes permanently taking place in the field of scientific and technical communication in English, so that they could further stay tuned to the elements of novelty occurring in their future activity at international level.

In what follows, we can only offer a selection of the instances and/or modes, modalities and models of providing support and input to the learners as regards the manner in which reality can be seen and depicted appropriately within the scientific and technical communication - written and oral - patterns.

We will initiate our exemplification by pointing out the umbrella-chapter for each example provided, and by giving certain illustrations, with a view to thus reconstructing the various facets of reality through the scientific and technical communicator's perspective. (We should perhaps add that an enlarged discussion of the course input is comprised in the course applications, but this material is not presented here for obvious reasons of space.)

Also, we would like to include precisely at this point a *Motto* input that precedes the course section on *Abstract Writing* as a text type, which could be seen, we believe, as a valid one for the whole course approach over reality as perceived by experts communicating in science and technology:

Motto: Life should be as simple as possible, but not one bit simpler – Attributed to Albert Einstein. *The same is true for abstracts.* The quote, inspired from the course references (Vallin 2008: 1), should be seen as a generic scientist's perspective on reality.

Table 1. STCE course syllabus – excerpt

Main Course Topic	Emphasized Aspects
Introduction to Communication	Definitions of terms; Features of communication; Forms of communication; Scientific and Technical Communication; The Communication process – elements; Barriers in communication; Opinions about communication - quotes
Accuracy of linguistic support in Scientific and Technical Communication (STC) - 1	Main grammar points – Syntax I (Word Order); Morphology I (The English Verb) – Avoiding frequent/common mistakes

Accuracy of linguistic support in STC - 2	Main grammar points – Morphology II (Nouns, Adjectives and Adverbs, Numerals, Determiners; Conjunctions, Prepositions a.s.o.) - Avoiding frequent/common mistakes
Accuracy of linguistic support in STC - 3	Main grammar points - Syntax II (Sentences, Clauses, Punctuation – problematic areas) - Avoiding frequent mistakes
Written Communication - 1 – The ‘Tools’	Paragraph structure; Elements of Style and Register; Emphasis on clarity, conciseness, and accuracy of expression; Modes of expression: descriptive, expository, narrative, scientific; Level of formality; Avoiding biased language
Written Communication - 2 – The ‘Process’	Main stages in the writing process; the Audience; the Process of writing: Collecting material; Planning; Outlining; Structuring; Drafting; Editing; Visual aids; Proof reading
Written Communication Text Types –3–TECHNICAL CORRESPONDENCE (e-mail messages, memos, letters)	Structure of letters and memos; Email Netiquette – Guidelines; Logical connectors
Written Communication Text Types – 4 - REPORTS	Report types; Technical report structure: procedure, results, discussion, conclusions, and recommendations.
Written Communication Text Types – 5 - ABSTRACTS	Main requirements in abstract writing - Guidelines
Written Communication Text Types – 6 - SCIENTIFIC JOURNAL ARTICLES	Scientific journal article structure; main requirements; citation issues; avoiding plagiarism
Oral Communication – 1 – PRESENTING A WRITTEN PAPER IN A CONFERENCE	Requirements of a PowerPoint presentation; turning written content into oral presentation; designing the appropriate visuals aids
Oral Communication – 2 – PARTICIPATING IN TECHNICAL DISCUSSIONS/MEETINGS	Expressing personal opinions, ideas, arguing etc.; Communication strategies/functions: negotiating, contradicting, evaluating, synthesizing etc.
Oral Communication – 3 – MAKING A BRIEF ORAL PRESENTATION	- Guidelines for making an oral presentation; Non-verbal communication; Dealing with fear; Off-the-cuff presentations (without preparation) – discussing feedback
Oral Communication – 4 – MAKING AN ORAL PRESENTATION	- More guidelines for making an effective, efficient, eloquent, and ethical oral presentation

To begin with, under the wider label of *communication*, the course input provides information on:

- the *process of communication* sides: externalized communication (whatever can be *seen*, verbal or non-verbal), metacommunication (what can be *understood* beyond words) and intracommunication (communication of each of us *inside* ourselves);

- the golden *rules in communication*: as a 6C-adjective list, comprising *clear, concise, courteous, constructive, correct, complete*;
- the manner the above can be concretely achieved in producing written and/or oral input in science and technology, viz. (i) by *replacing needlessly long prepositional phrases* (e.g. *In reference to* - replaced by *about*, or *regarding*); (ii) ways of improving *sentence clarity* – tips and examples provided.

Then, *discourse, register* and *style* specific to the scientific and technical communication patterns are analyzed:

- advice concerning the scientific and technical writing *style* is given, examples could be the following: *Focus on action and actors. Write each sentence so it is lively and easy to read. Write each sentence so it works together harmoniously with those that surround it*;
- a discussion on *writing*, seen as a *genre-based element*, with a focus on *discourse analysis* – *types of genres and corresponding specific text types* being provided and discussed;
- the above are completed with information on the specific *punctuation*, for each text type separately (e.g. *Use brackets [] for material inserted into a quotation and ellipsis (three dots) for material omitted*: According to Smith (2008), few such [descriptive] studies were done ... before 1997.);
- as a corollary to the *written communication* section on text types, a complete table is provided, with the *typical elements contained in the front matter of various documents*: *Title, Abstract, Executive summary, List of figures, List of tables, List of terms, Acknowledgements*.

Next, ways of adjusting/adapting to the *audience profile and needs* are discussed:

- a presentation of *types of readers recognized by effective technical writing according to different levels of expertise*;
- concrete examples are given, such as the following: *Technicians (Keep introductions and background information brief; when appropriate, reduce information to instructions on how to perform a procedure or diagnose and fix a problem; keep sections and overall instructions as short as possible; use graphs and tables)*.

Visual aids and their role are also presented, providing information as to: *What Type Is Appropriate to What Type of Information*.

In what follows, we will illustrate the *Opening* section to the *Oral Communication* module, by providing the *objectives* presented to the learners, as they can clearly point out the manner the course input help the students to understand and cope with the features of the reality they will be going to perform:

- *Understand more about how to effectively prepare your presentation – so that your audience will clearly understand your most important points.*
- *Understand the pitfalls that most people fall into when putting their presentation slides together – so that you will not make the same mistakes.*
- *Learn about ways of structuring your presentation, so that you can get a format that will make your presentation more powerful.*
- *Learn how to construct a successful presentation.*
- *Learn about how to grab your audience's attention.*
- *Become confident of which presentation strategies to use and why.*

Similar principles in depicting reality are maintained throughout the entire *Oral Communication* module input. They refer, among others, to the following aspects:

- guidelines in *enhancing delivery style* in making oral presentations, e.g. *Avoid overuse of abstract, polysyllabic words. Instead, use concrete language that your audience can visualize;*
- speaking to a *multicultural audience* – a reality of our globalized society not to neglect in professional communication, for instance: *you will need to do research to understand how people from other cultures will likely interpret what you say & how you say it;*

As far as *Participation in Meetings* in the professional sphere of science and technology is concerned, both *tips and appropriate chains of language* to be used, grouped per *roles* that participants can assume in such instances of communication in reality, as well as *features/attitudes of good speakers* are given, as can be seen from the following examples:

- An Effective Meeting Facilitator: *sets a positive, productive tone for interaction among the meeting participants; reviews the goals, or anticipated outcomes, and the agenda; helps group members stay focused and productive; keeps participants on track; ensures the accomplishment of expected, desired results from the meeting;*
- Best Attitude - 7 messages of a good speaker: *I will not waste your time./ I know who you are and why you came./ I am well organized./*

I will deliver my speech in an interesting, conversational way. / I know my subject. / Here are my most important points. / I am finished.

As today's reality means working in a *multicultural* community in most of the cases, *Meetings and Intercultural Differences* as a topic of interest is allotted adequate course input of various types, ranging from *sensitizing* the students as to the existence and complexity of the phenomenon, through providing *advice and tips* of behavior, and finishing by suggesting them to continue to search the Internet and other resources on each aspect whenever they are in the position of coming across co-workers from a variety of cultures, as can be seen from the example below:

- Meetings and Intercultural Differences:

Visiting a foreign culture can be confusing for even the most fearless traveller. / Be informed – A useful resource (covers all of the essentials of conducting business globally) is <http://www.executiveplanet.com/> Simply select your destination country – you will receive an overview of cultural do's and taboos, suitable etiquette and advice on appropriate professional behaviour in specific areas of the world.

To conclude this very brief set of exemplifications from the STCE course of the ways and means of helping the learners to understand reality adequately and to adjust themselves to it professionally as communicators, we provide - as Figure 1 - one item which has the role of synthetically summing up the most important input for an oral presentation.

MOST IMPORTANT ITEMS FOR ORAL PRESENTATIONS
body language <i>(particularly facial expressions and gestures),</i> eye contact, proximity <i>and</i> posture They have a role in: conveying meaning, avoiding misunderstandings <i>and</i> fitting in with the audience's culture.

Figure 1. Sample STCE course input

3. Concluding remarks

This study should be seen only as an attempt to select and/or compress for illustration purposes one component that should be considered as fundamental in designing a STCE type of course, namely the intention of providing the learners, would-be engineers evolving in the professional context of today and mostly of tomorrow, the basic 'kit of tools' that could help them to further be aware and flexible with respect to the changes in the reality around, as seen by a scientist.

There are certain *open* conclusions that can be listed here, in a non-prioritized order, though:

- the course design should emphasize the essential aspects, which should correspond to the clear-cut objectives, an awareness of one's limitations being really necessary in order to operate valid inspiring-for-the-learners selections;
- numerous opportunities should be ensured for the learners to imagine themselves as communicators in a reality of their profession - and of the world at large - that keeps changing;
- the criteria in sampling input and in devoting it the appropriate amount of time in the course time frame also depends on the negotiated upon priorities, which can differ considerably from one educational context to another. Therefore, it is the course designer's responsibility to adapt/adjust input to these elements, by operating selections and prioritizations.

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