DECODING TECHNICAL TEXTS: TEACHING READING COMPREHENSION SKILLS TO CIVIL ENGINEERING STUDENTS

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Abstract: *As the scientific and technical information is mainly transmitted through the written document, it is the text that will represent the main didactic support in developing a technical terminology lesson. Therefore, its approach should lead progressively to acquiring the reading comprehension skills.*

In teaching technical English reading skills where the cognitive function of language is the research itself, one should see the text as both a source of information and a model of producing language, its didactic exploitation having its basis on these two essential features.

Reading a technical text should involve the student in a complexity of habits which have been already attained in their mother tongue when they decoded messages above the resources of a language (lexical and semantic levels or even at the syntax one). For that reason, the purpose of the reading activity is to get the wanted information in a quick and exact manner. In attaining this purpose, the teacher needs to use motivational strategies following mainly the student's multifarious involvement during the lesson.

Keywords*: technical English, active learning, creativity.*

Introduction

As long as the ideal of teaching English literature is to develop the passion and taste for reading with a critical look, to see students reading masterpieces of literature in original when they turn reading into a permanent behaviour, so should technical English lead to a not less important target, but with a greater social involvement namely acquiring a specific conduct in research, a typical feature of all engineers.

Stages of research in the field

After the Second World War, a new era of massive and unique development in technical, scientific and economic field was announced. This development shaped a world unified and led by technology and commerce – that in their inexorable advancement almost immediately produced a demand for an international language. Due to many and different reasons, particularly the economic power of the United States during the post-war world, this role belonged to English.

The consequence was the creation of a new whole mass of people eager to study English, not for the status of being able to speak and understand Shakespeare's language, but because English was the key to the international currencies both in technology and economy. Speaking a foreign language had been, by and large, a mark of an accomplished education, but very few people (students and teachers) truly questioned why it represented a necessity. After English turned into the international language of technology, replacing German, it formed a new generation of learners who discerned very clear why they were learning a language: mechanics that had to read the instruction manuals, engineers who were required to keep up with the developments in their domain and a whole range of students whose courses and seminars consisted of textbooks and journals mainly available in English. What was the most important issue

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in this environment was that all the already mentioned categories had become conscious of the fact that knowing English represented their priority.

The purpose of the study

Being confronted with the real necessities of the modern public, the teacher will pay a lot of attention to the reading text, seen as a complex linguistic unity whose signification proves to be more than a mere sum of "structural, functional, notional" meanings as language description usually does (Hutchinson and Waters, 1987: 126-133). Technical English actually represents the transformation of referents into a context which is compulsory for understanding the gist of phenomena. Therefore, it becomes vital to develop a practice in which students focus on information, leaving behind the reading technique as simple didactical demarche. Thus, students should become aware of the priorities of the informational objective that is getting the information as exact and fast as possible.

According to already "classical" methods of teaching reading skills, the most common strategy is that of active procedure. The student follows the technique of identification of different organizing details such as titles, subtitles, italics, bolded words etc. The real issue is that for civil engineering students, the text adds a new kind of organizing information. We have to face all sorts of data, tables, statistics, and graphics. Consequently, the present study will deal with teaching reading technical texts through active procedures. We will leave behind the traditional methods of pre-reading, reading for main points and reading for finding specific information and, instead, we will focus on classifying and text-restructuring through sequencing and showing difficulties with definitions and application of meanings.

Introducing data

At this point, the teacher starts a dialogue which schematically, is oriented towards:

- the bindings between the title and subtitle;
- the repetition of some important words;
- identifying international symbols and international words, also noticing false friends;
- identifying linking words and expressions (*it can be seen in chart that, given that, on condition that, provided that*);
- discussing or largely interpreting the images;
- clearly establishing the texts' issues.

From this first contact with the text, the teacher will ask the students to find the most important elements - lexical or not, an activity which is developed through dialogue again. Thus, we reach to the second phase of clarifying the terminology and statements which include the essence of the message. Step by step, these phases will be shortened to being eliminated due to the fact that students become accustomed with the global content and they can form the skeleton to which they pass to analyzing in detail. Reaching this stage, we can leave the students read by themselves the whole information and their task remains extracting the main ideas. Because this method consists of leaving the student work individually, he will be allowed to use dictionaries and other sources of information (Wikipedia, guides, Answers.com etc). Hence, after a period of approximately twenty-thirty minutes – keeping in mind how difficult the text is – the students will present orally the main ideas of the text. This activity will involve more students because it includes both sequencing and debating.

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Highlighting details through graphics and tables

Reading for specific information is a traditional activity, yet finding out *how* a student takes out exact information is quite challenging. The first stage of this activity is placing the ideas in logical unities that structure the text. This task is often difficult for the reason that some of the already mentioned unities do not always concur in texts with their graphical succession. Accordingly, the students need to get used to a systematic re-ordination of ideas in relation to the logical structure of the message. The systematization will have as a result the linguistic scheme (Yalden, 1994: 83). At this stage, dialogue is used again. Students propose solutions for separating the logical unities. The best formulations become titles of logical unities in the left column of the scheme. On the right column, the information present in that unity is written and, separately, the teacher writes the lexico-syntactical structures which have been used or can be used for expressing the analyzed content. At this juncture, there will appear the actualized structured from the text and even others suggested by students.

Example

Iris Eisenbach, *English for Materials Science and Engineering Exercises. Grammar, Case Studies*, Springer Fachmedien Wiesbaden GmbH, 2011

3.2 Mechanical Properties of Metals

Bend Strength

Fracturing, e.g. a rod of brittle material, can be done by fixing it tightly at both ends and applying a force upwards at two central points. Fracture will appear almost perpendicular to the length of the rod. This is one way of measuring the bend strength of material.

Shear Strength

Breaking the rod by fixing it at one end and twisting the other end, applying shear load or stress (tau), will result in fracture that occurs at an oblique angle to the length of the rod.

Stress (sigma) is the ratio of a force F to the area A on which the force acts: F/A = lb/in2 (lb meaning 453.592 grams, in meaning inch).

Shear strength is important for rods of material that rotate like rotating axles in machinery which sometimes fail this way.

Tensile Strength

Most metals show macroscopically noticeable stretching. Brittle materials, like ceramics, show very little plastic, i.e. permanent deformation, before they fail. Materials with high tensile strength, like plastic and rubber, will stretch to several times their original length before they break.

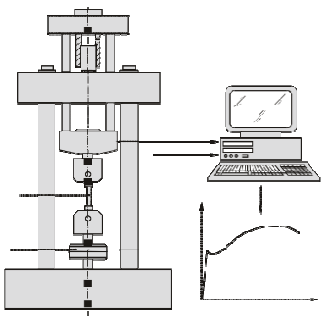


Figure 6: Testing Tensile Strength

(pp.27-28)

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Information given by the text	*lexico-syntactical structures*
Strength to → bending → shearing → tension	- fracturing appears by fixing the ends and applying a force upwards at two central points, almost perpendicular - breaking appears by twisting axles - macroscopically noticeable stretching

Glossary
rod = a thin, straight piece/bar, e.g. of metal, often having a particular function
axle = a supporting shaft on which wheels turn

The method of highlighting details through graphics and tables presents the next advantages:

- lexico-syntactical structures show the connection between the content and the way of expressing physical phenomena;
- studying language does not appear as a purpose in itself, but it becomes integrated to both text, meaning the given information, and grammatical structures (in our case gerund), the latter being easily assimilated;
- is a formative model of logical analysis applicable to texts by synthetic reorganization, a *sine-qua-non* operation in handling technical information;
- descriptive texts become easier to be run over;
- facilitates the introduction of new items at the lexical level. Due to the mono-referential character of technical vocabulary and to the tendency of standard representations (sigma, tau, formulas), teaching vocabulary turns out to be an easy task.

To sum up, highlighting details through graphics and tables has an important contribution to understanding the content of the technical message, spontaneously eliminating errors caused by an insufficient knowledge of English as a foreign language and its structures. Moreover, in an active sense, studying through schemes, presenting transversal sections, longitudinal or in elevation, internal structures of the elements or mechanical properties of different building materials, leads to practicing not only the reading skills, but also some productive skills such as speaking and writing, determining students to have a rigorous and tidy analysis using the different logical relations.

Following a reasonable progression of the text and facilitating comparison and assessment of all the elements and structures presented, the method of highlighting details through graphics and tables appears as extremely efficient because information can be offered in both direct and indirect succession in accordance with the didactic needs. This method also cultivates some aspects of scientific and technical judgment such as the associative capacity and critical thinking.

Reading for research and documentation

The highest level of reading activities consists in what traditional methodology handbooks name: “further reading”. At this point, when students are already familiarized with technical texts, teachers may pass to another type of lesson meant to develop the habit of reading magazines, books and articles from the internet with specific information regarding constructions. This type of activity is a necessity nowadays and, in addition, stands for the favourite activities of civil engineering

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students. Thus, they will be happy to read articles available online such as *American Society of Civil Engineering (2008-2012). Civil Engineering Body of Knowledge for the 21st Century*. Regarding this aspect, Susan E. Nesbit, Robert Sianchuk and Rebecca Kindiak appreciated last year that:

> Affective Learning in Civil Engineering Education included among the many calls for increased breadth of learning achieved by civil engineering graduates is a new emphasis on affective learning. For example, the "sustainability" and "attitudes" learning outcomes identified in the American Society of Civil Engineering's Book of Knowledge (ASCE, 2008) imply belief sets related to professional ethics and world-views, which, while not necessarily new to civil engineering practice, are newly emphasized within the post-WWII context (Nesbit et al. 2012: 2).

Taking into consideration that the articles are rather difficult and make reference to complex matters, usually this kind of activity is included in the student's assessment through portfolio. The curricula for civil engineering students include in the first two years of study, 1 hour / week of individual research for foreign languages and this hour should be quantified in the final grade. Therefore, in the case of English, the teachers may use this type of activity in the classroom.

All in all, this type of activity is very motivating for the adult and self-conscious students, interested in learning technical English. The articles offer a rich and varied content and the graphic presentations as well as the big number of images, schemes and calculi make easier to reach the message. Consulting these kind of articles, accustoms the students with handling the online dictionaries as a working method, offering them autonomy and self-appreciation of knowledge and skills. Students learn to re-discover, to evaluate and to apply a series of skills previously attained, showing interest for authentic documentation and recent information. The new data being consciously assimilated, offer the students trust in their own capacities and stimulates the curiosity in the direction of technical creativity.

Getting in contact with articles written by specialists has as principal aim not only the access to scientific and technical documentation, but also familiarizing the students with linguistic models used and the technique of academic and technical writing. Students are asked to notice the most important constitutive parts of a paper which are generally common and repeatable:

- introduction – showing the importance of the studied issue;
- stages of research in the field;
- purpose of the paper;
- content – presenting the theme starting with the hypotheses, then stating the experimental data, calculi leading to conclusions and applications;
- general conclusions where there are mentioned the fields of applicability, advantage and possible inconvenient of the method and the author's recommendation;
- references or bibliography

Being used with these elements, students can easily find the information they need and they get used to the formal exigencies of different papers.

Conclusions

Reading comprehension skills taught to civil engineering students should be, first of all, focused on the need of the targeted public keeping in mind their level and

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interests so that the aim of the activities be consciously attained, in an active way with immediate social output.

Without ignoring the traditional principles and methods of teaching reading skills, each teacher of English for Specific Purposes should have his/her own creativity in designing the reading activity and the other integrated skills, with ideas delivered by the classroom situation which introduces the necessity of formative aims.

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