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Communicative Texts' Modelling of Engineering Profiles as a Methodological Problem

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Abstract

The article presents methodological materials for teaching professional foreign language (Russian), which stimulate foreign students' communicative competence in the sphere of educational and professional communication. The structure of texts in terms of their communicative purpose is analyzed and the subject of speech in the "fabric" of the text based on the example of texts in "General Electrical Engineering" is discussed. The proposed approach introduces international students to the particularities and traditions of the presentation of scientific and technical information adopted by Russian engineering schools as one factor in the development of language culture.

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1. Introduction

One of the difficulties in teaching Russian language to foreign students is teaching the rules of forming textual unity, especially the method of extending ideas of the subject of the speech into the "fabric" of the text, depending on the writing task.

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«Optimizing the process of mastering Russian as a foreign language will help to continue further research on the creation of text classifications, which reflect features of the "thinking process of an engineer", which corresponds to the current trend of pragmatism of education» (Petrova, 2002). Thus, we took engineering texts intended for students of the 3rd course into consideration, namely materials of the textbook "General Electrical Engineering."

The practical significance of the study lies primarily in the fact that we consider engineering texts as the original manifestations (conductors) of the communicative content of engineering activity, as manifestations of engineering thoughts. One of the ways to investigate such content is to analyze the texts' structure in terms of their communicative organization, highlighting the typical rheme-thematic models (Danes, 1974).

The author's results include methodological materials for teaching a foreign language (Russian) for professional purposes, which will enhance the formation of the communicative competence of foreign students in the field of educational and professional communication. This experience will help lecturers to teach foreign students how to perceive and retrieve professional information and how to read professional literature more easily and quickly. The proposed approach will contribute to the familiarization of foreign students with the attributes and traditions of the presentation of scientific and technical information adopted by Russian engineering schools that will be one factor in the development of language culture.

In the course of mastering a foreign language as a means of professional communication, verbal interaction between people educates cultural differences, thereby allowing the formation of the secondary linguistic identity and the development of foreign language competence. It can be recognized in the ability to perceive written information according to the communicative intent and the ability to choose verbal behavior in accordance with the role and the situation of communication (Glaser Rosemarie, 1990; Ehlers Swantje, 1992).

The didactic material is organized in view of engineering **students' cognitive style** (the term which is used by Avdeeva I. B.): 1) students prefer circuits and written explanations, 2) information processing is based on the following principle: form perception - primary, general meaning -secondary, 3) students prefer orderliness and external organization (Avdeeva, 2005).

The study of the communicative organization of the text was firstly studied by V.Matezius, who developed the theory of actual division sentence according to the degree of actuality of the expressed information (V. Mathesius) This approach allows us to review the sentence and the text in the dynamic aspect. In other words, the idea of communication is realized from the theme (which is pronounced by the speaker or which is laid out in the field of view of both communicants) to the rheme (new and actual), for which the communication takes place. Thus, these two complementary communication centers are integrated into indissoluble unity of the text.

According to G. A. Zolotov's research, the role of the rheme and its textual features, as a part of its concept of rhematic dominant idea, is defined as a concept of communicative registers, topic-comment structures, and their types. The communicative structure of a text is characterized as having certain cohesion of the theme and rheme in statements, which emphasizes the information (Zolotov, 2010).

As opposed to other languages, Russian has a relatively free word order. This order is communicatively defined, however. In other words, according to Russian word order the informational content is changeable. This feature causes significant difficulties in mastering the Russian language, especially, in reading (understanding) and production of a text. Let's take a closer look at the specific features of the communicative modeling of a text of an engineering profile on the example of "General Electrical Engineering."

2. Methodology

2.1. Data

As a part of the topic "Double-winding transformer in linear operation" for students of technical specialties who study Russian as a foreign language, the following lexical-grammatical challenges are met (Kurikova, Pustynnikov, & Shandarova, 2010):

- Improving vocabulary by exploring new words on the subject, including synonyms, antonyms and equivalents;
- Getting acquainted with the concept of "Transformer";
- Getting acquainted with the concepts of "Grammatical starting point" and "Communicative focus" to develop the skills of skimming and providing a literate presentation on the text.

Obviously, the first problem is purely linguistic, the second is aimed at the development of professional information, and the third is aimed at the acquisition of practical skills of working with the text in order to learn how to extract certain information, including professionally oriented information.

Thus, how to speak about the transformer? Students have already known from previous topics that in Russian grammar the information basis of the sentence is a predicate (hereinafter - P), which reports on the subject of the speech. The subject of the sentence (a person or thing) (hereinafter - S) can be expressed as:

- open - (**S-act**) The current (**P**) is operating;
- close - (**P**) The problem is being solved by us (**S-we**);
- passive - (**S-pass**) The problem (**P**) can be solved;
- hidden – The scheme (**P**) can be changed

Note: the addressee is not randomly selecting a way of expressing the subject. The choice depends on the author's intention to introduce a grammatical «starting point» or communicative "focus" when observing the situation. Consider the example of a grammatical starting point. Compare the sentences:

1. *A transformer is (S) a static electromagnetic device for converting AC electric power.*
2. *(S) A transformer is a static electromagnetic device for converting AC electric power.*
3. *(S) A static electromagnetic device for converting AC power is called a transformer.*

In the first and third sentences, the grammatical "starting point" is the subject of "static electromagnetic device". This means that the author of the text, expressing his or her ideas about the subject, "take the count" from this subject to other objects, actions, etc., that is, a grammatical model "what is called then" = "what is what".

The subject of the second sentence is "transformer". This means that the writer / speaker wishes to draw the reader's or listener's attention to the transformer.

The grammatical starting point is usually expressed in a sentence without regard to the context and reflects a way of expressing the idea. The communicative focus expresses the relationship with the context, and reflects not only the way of expressing the idea, but also the way of producing the idea in the "fabric" of the text. The "subject" takes second billing, the "starting point" takes center stage (Point - hereafter referred to as P), and the communicative focus as "new" information (New, hereafter referred to as N) which is becoming necessary for the reader.

In this case, not only the grammatical model is important, but also the word order. Let's compare:

1. *A transformer is a static electromagnetic device for converting AC electric power ("device" is in focus).*
2. *A static electromagnetic device for converting AC power is called a transformer ("transformer" is in focus).*

In the above mentioned sentences the grammatical model "what is called then" is the same but the meaning is different.

Let's take a close look at the deployment of communicative structure in the text: PN - P1 (N) N1 - P2 (N1) - N2, etc.

For instance:

1. *(P) Today we'll speak (N) about transformers. (P) A transformer is (N) a static electromagnetic device for converting AC electric power. / A (N) static electromagnetic device for converting AC electric power is a (P) transformer.*

2. *(P) Let's look at (N) a static electromagnetic device. (P) A static electromagnetic device for converting AC power is called (N) a transformer.*

The communicative structure of a "static" idea which is not articulated in the text can be presented as: **PN - P N1 - P N2**, etc.

The "static" idea describes a sentence without any changes in the starting point, only in the focus of observation.

For instance:

"In 1885 Hungarian scientists M. Dery, O. Bluth, and K. Tsiperovsky developed a single-phase transformer. In 1889-1891 the researcher M. O. Dolivo-Dobrovolsky proposed a three-phase transformer"- it does not matter who designed the transformer, but it is important what kind of transformer was invented. In this situation only the focus of observation moves; the position of the items is not changed.

2.2. Practical use

Why is it necessary to know the meaning of the grammatical "starting point"? (Halliday, 1985).

- **The grammatical starting point helps us to understand and construct the sentence properly.**
- Why is it necessary to know the meaning of "communicative focus"?
- **The communicative focus will help us to understand the situation and/or picture and to construct the text properly.**

Students are offered some practical exercises that will help them to develop work their skills of obtaining information from a text. The aim of these exercises is to analyze the expression of the grammatical subject, as well as to identify active and passive grammatical patterns that determine the communicative organization of the text. Upon completion of this activity, students should understand that in scientific texts the target of research is in the thematic position, and therefore, it is used either in passive or indefinite-personal constructions.

Task 1. Read the sentences and determine the way of expressing the grammatical subject (S) (active / passive, open / hidden) in group A and group B. How can we explain the frequency of selection of such subjects in professional language?

Group A

1. The device is designed to convert electrical energy of AC.
2. Power plants are usually in outlying districts away from consumers.
3. The transformer is designed for normal operation of the winding.
4. The auxiliary quantities of calculation are introduced.
5. The power supply is fed to the transformer winding.
6. All the coils are threaded by the same magnetic flux.
7. Isolation of inductive coupling is used to simplify the calculations.

Group B

1. The magnetic core with the windings of transformers up to 50 kVA and above was dipped into a tank with mineral dielectric oil.
2. Inductively coupled coils are marked and similar charges are indicated.
3. $\dot{U} = Ue^{j\psi}$ is applied a voltage to the input circuit.
4. The windings are placed on the yoke.
5. The equivalent conversion schemes and properties of electrical circuits are applied.

The following exercise (see. Task 2) will allow students to understand that in Russian scientific texts passive and indefinite-personal sentences are similar:

Task 2. In what sentences can the grammatical model of Group A be changed to the grammatical model of group B (see. Task 1)?

Having analyzed the grammatical model of the text students are offered to work with the extended text, where the grammatical starting point and communicative focus are analyzed (see. Task 3).

Task 3. Read the text and determine a way to express the grammatical subject (S) (active / passive, open / hidden) and communicative focus (new).

1. Transformers are widely used in various fields of electrical engineering. - In various areas of electrical engineering transformers are widely used.
2. The widespread currency of power transformers was gained. - The company used power transformers. - Power transformers are used at the plant.

In learning activities similar to those mentioned below, students observe how the idea of professional texts can be developed and draw an inference from the relationship between the communicative intention of the writer and the communicative structure of the text.

Task 4. Read the text fragments. Build a diagram of the communicative structure of the given text. How does the author explicate the idea: dynamically (consecutive) or statically (in parallel)? Why?

1. The transformer is designed for normal operation only at certain values of frequency, power, current and voltage which is called nominal. Transformers' nominal load is different. You can see transformers in any radioelectronic devices with the capacity of volt-amperes. The power of a three-phase transformer for ETL is 1 mil. kVA.
2. The transformer has at least two windings with a common magnetic flux. Most transformer windings are on the magnetic circuit. There is no magnetic circuit in an air-core transformer.
3. A static electromagnetic device for conversion of electric energy of AC current with one potential difference into electric power of AC current with another potential difference is called a transformer.
4. The first transformers with open magnetic circuits were invented in 1876 by P.N. Yablochkov who used them for electric "candles." Today transformers are widely used in various fields of electrical engineering and radio engineering; and in measurement devices and automatic control and management.
5. The widespread currency of power transformers was gained as a part of an electrical network. The transformer is designed for normal operation only at certain values of frequency, power, current and voltage which is called nominal. The transformer has at least two windings with a common magnetic circuit, which are electrically insulated from each other.

Once they understanding the principles of the text in Russian, students may be required to match the title and the content of the text. This task improves writing skills (essays, course papers, reports), which is essential for the educational and professional spheres of communication.

Task 5. Match the title of the text with the main idea (thesis), and vice versa.(see Table 1)

Note: The title as a communicative focus is at the beginning of the text: "The scope of transformers' applicability" with the focus being "the scope of applicability." So the main idea in the sentence will be expressed as: The transformer is used (where?) 1) ... 2) ... 3) ... (in the fields of electrical engineering and radio engineering; and in measurement devices and automatic control and management).

Table 1. Example of task 5.

Title	Main idea
A transformer as an electromagnetic device for converting AC electric power	An electromagnetic device for converting AC power is called a transformer
Transformer definition	
Appearance of the first transformer with open magnetic circuit	The first transformers with an open magnetic circuit were invented in 1876 by P.N. Yablochkov
Transformer as an economical transmission and distribution device	
	The magnetic core with transformer windings of 50 kVA and above was dipped into a tank with mineral dielectric oil.

As a final task we propose making up a text based on the plan presented in task 6. Based on the above mentioned tasks, foreign students can transform the nominative model plan into a thesis, examining the rheme changes (see. Task 6).

Task 6. Tell (write) about the transformer according to the plan:

1. The concept of the transformer.
2. The origin of the transformer.
3. The scope of transformers' applicability
4. The advantage of the transformer to the generator.

5. The Purpose of the transformer.
6. The windings of the transformer. Primary and secondary windings.

3. Conclusion

The article gave examples of tasks for improving professional language skills and ways of thinking about the subject. As a result of training the student can distinguish between a grammatical starting point and a communicative focus, which may or may not coincide in Russian. A grammatical starting point, as opposed to the communicative focus, shows only a way of presenting information, without regard to the context and without unfolding the dynamics of thought. In addition, the student develops methods of rheme transmission (communicative focus), which is usually defined by the order of words in a sentence.

Undoubtedly, solutions to methodological problems in real communication help students to improve their motivation for learning a foreign language. According to the results of the experimental work with the Chinese students there was a positive dynamic in the development of professional skills, foreign language skills, and a positive attitude to foreign language. Positive results were obtained thanks to the creation of a language-professional environment that encourages the development of professionally-oriented reading as a basis for the development of students' critical thinking in technical fields.

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