



# Cognitive-systematic methodical compression concept: methods of students' communicative competence development at non-linguistic university

**Concepto de comprensión metodológica cognitiva  
y sistémica: métodos para desarrollar la  
competencia comunicativa de los estudiantes de  
la Universidad no lingüística**

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**ABSTRACT:**

**RESUMEN:**

The aim of the article is to present a set of cognitive techniques for teaching students studying a foreign language at non-linguistic universities: algorithmic method, lexical-grammatical mapping and syntagma expanding technique. These methods, used to work with reading foreign language professionally-oriented texts, have proved to be effective and productive during the conducted pedagogical experiment. The article outlines the prospects of using methods of methodical compression when working at communicative competence development and professionally-oriented foreign language communication.

**Keywords:** education, methodical compression, lexico-grammatical mapping, teaching reading, algorithmization

El objetivo del artículo es presentar un conjunto de técnicas cognitivas de aprendizaje de los estudiantes que estudian un idioma extranjero en las universidades no lingüísticas: el método algorítmico, la visualización léxico-gramatical y el método de expansión del syntagma. Estos métodos utilizados para la lectura de textos orientados profesionalmente no lingüísticos han demostrado ser eficaces y productivos durante el experimento pedagógico. En el artículo se señalan las perspectivas de utilizar métodos de compresión metodológica para el desarrollo de la competencia comunicativa y la comunicación orientada profesionalmente a los extranjeros.

**Palabras clave:** educación, compresión metódica, léxico-cartografía gramatical, enseñanza de la lectura, algoritmos

## 1. Introduction

The use of cognitive learning teaching methods focuses on the predominance of the processes of procedural knowledge and includes the following methodical techniques:

1. Reliance on the principle of meaningfulness;
2. Reliance on the on the idea of assimilation of foreign language material in the system;
3. The use of system-structural generalizing technologies;
4. Orientation to the compression of educational material.

The intended systematic use of these methods at non-linguistic university can significantly improve the efficiency of communicative competence development (Lyubimova & Gorozhanov, 2011).

This conclusion is a result of the pedagogical experiment conducted during 2018-2019 at Volgograd State Technical University for the students of the 2 year of study learning English to apply in the scientific field of «Metallurgy and material processing technologies». During this period we introduced the communicative competence development technology, based the concept of cognitive-systematizing development in educational process of the experimental students' group where we used algorithmic method, lexical-grammatical mapping technique and the method of expanding syntagmas.

By training method we mean a method of instruction and a set of educational-cognitive activities organized by a teacher for a student to find the solution of various educational tasks, aimed at mastering the material being studied (Kharlamov, 2003).

Teachers and didactics scientists developed a very stable classification of teaching methods according to 1) the source of information (verbal,

visual, practical), 2) the nature of didactic goals and solving cognitive problems (methods of oral presentation of knowledge by the teacher, methods of consolidation of the material, of independent students work to understand and assimilate new material, methods of educational work on the application of acquired knowledge in practice, methods of verification and evaluation of knowledge, skills), 3) the method of assimilation (explanatory, illustrative, reproductive, problematic, partly-search, research) (Igna, 2010). Knowledge of these methods is a mandatory component of the teacher's qualification.

The most recent linguodidactic tendency to focus on the activation of students' cognitive activity and increasing the level of their independence caused a widespread use of teaching techniques, combining features of different methods: stimulation and motivation of learning process, organization and implementation of cognitive activity, control and self-monitoring of the effectiveness of educational and cognitive activity (Pujman, 2002) and many others. These kind of combined methods to a greater extent meet the new level of requirements for learning outcomes, as well as fully comply with the new mentality of a young man, formed under the influence of modern living conditions in a rapidly changing world. In addition, it is necessary to use specific teaching methods that have emerged in the field of foreign language teaching (Nikitina & Nozdrina, 2006).

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## **2. Methods**

The system of algorithms construction and methods of their use in the process of foreign language education were developed by Ch. Chelone (2017), D. Matsko (2016), A. Solomatina & R. Belyansky, 2016 etc.

However, in these works the authors explain only some points of presentation methods and application of algorithms in the practice of teaching foreign languages. They do not show the full potential of the algorithmic method in the process of communicative competence development at non-linguistic university.

In the process of conducting the pedagogical experiment, we came to the conclusion that this method is quite effectively implemented in the context of lexical competence development – in activities aimed at a meaningful understanding of an unfamiliar word/term. Such tasks have the purpose of forming grammatical competence through grammar blocks practice and in the process of organizing foreign-language text activities that lead to understanding a foreign-language text at the level of meaning (Kochetkova, 2010).

Due to the fact that in modern conditions the main task of teaching a foreign language to students at non-linguistic universities is the formation of their professional foreign language competence as an important component of professional training in their chosen specialty, the actual aspect of foreign language training is the development of skills of professionally oriented reading.

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### 3. Sample

Components of communicative competence, developed at a proper level with the help of developed theoretical provisions and practical techniques, form a socially, communicatively and professionally mobile personality, able to build and update their professional competence, using the possibilities of the latest educational technologies, including the use of a foreign language (Dobrova, 2011).

Due to the fact that an integral part of foreign language education implies the mastery of universal methods of operating with unfamiliar material, the method of algorithmization, or algorithmic method becomes of particular importance (Bondarenko, 2003).

In pedagogical psychology the algorithm is an accurate, generally understood description of a certain sequence of intellectual operations necessary and sufficient to solve any of the problems belonging to a certain type (Kazakova, 2015).

A significant prerequisite for the use of algorithmic method in teaching is P.Ya. Galperin's methodology of the mental action approximate basis. The disadvantage of all existing methods, according to P.Ya. Galperin, is that knowledge, skills and abilities are acquired not in the process of action and not through rationally organized actions, but more often as an arbitrary, mechanical memorizing (Gal'perin et al., 1996).

Modern researchers have long concluded that effective learning is determined by the identification of a number of mental operations and learning to follow them clearly. The practice of teaching foreign languages, based on the knowledge of the educational paradigm, proved that knowledge of the rules does not ensure the implementation of learning goals without mastering the operational side of thinking. So, according to Semyenov V.O., due to the fact that "one of the most important problems of pedagogy and psychology is the problem of management of mental processes occurring during training, <...> algorithmization in teaching is one of the most effective aspects of the introduction of accurate methods in pedagogy" (Semyenov, 2006).

Major didactic characteristics of the learning algorithms were studied by P. Gal'perin (1996), N. Talyzina (2011), R. Zarubina (1999), S. Mumryaeva (2001) etc. Scientists highlight some essential features of the algorithms. Thus, M. Lapchik (1988) and V. Bessel'ko (1977) call them "basic properties". N. Talyzina highlights the "requirements" for algorithms (Talyzina, 2011).

Systematizing and summarizing the intrinsic characteristics/ properties of the algorithms described in the above mentioned research works; the following aspects should be noted:

1. Determinism, or severe certainty, or constructiveness, suggesting "the uniqueness of the prescribed actions and operations, which excludes the random selection of actions" (Talyzina, 2011).
2. Uniqueness of the original data and the avoidance of its different

interpretations, which leads to the reduction of successive operations to a guaranteed identical and accurate result.

3. Discreteness – the division of the whole process into separate sequential steps, resulting in an ordered set of "clearly separated from each other prescriptions, directives, commands" (Bespal'ko, 1977, p.15).

4. Certainty, which implies simplicity and unambiguity of operations.

5. Effectiveness, which means that the algorithm is aimed at obtaining the desired result.

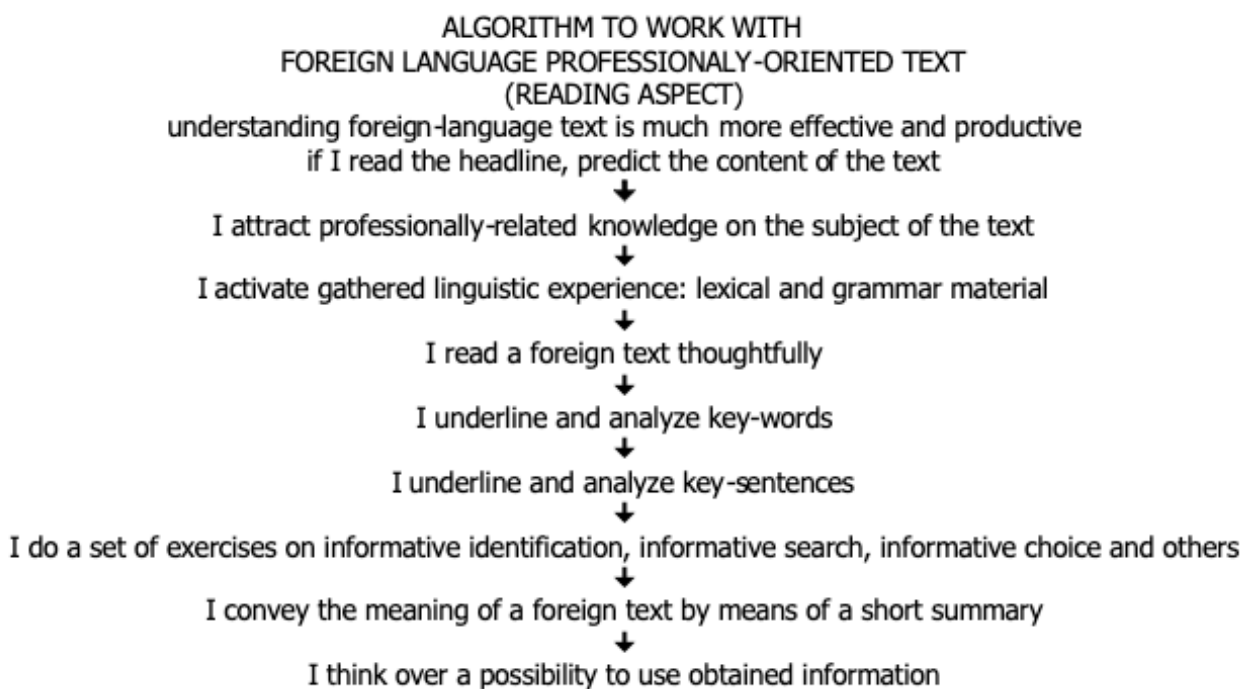
6. Mass character, i.e. suitability, efficiency to use in relation to the whole class of similar tasks.

Thus, the algorithmic method involves a clear definition and structure of the activity, the uniqueness of the prescribed operations, eliminating the randomness in the choice of actions that is expressed in the form of a scheme – its graphical visual representation.

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## 4. Results

In order to optimize the process of understanding the content of authentic foreign language texts significant for second year students in their specialty, we have developed, in particular, the following algorithm.



In the process of cognitive educational paradigm realization students not only absorb some information but comprehend the internal mechanisms of the studied objects of a language. Furthermore, the learners are encouraged to initialize research thinking, increase their concentration and develop mental activity. In this case, a highly effective growth of mental activity occurs in the process of conscious and sound reasoning provided by a high level of serious cognitive activity (Lipman, 2001).

At the initial stage of our experiment we investigated the nature of the category of *understanding* and pointed out that the process of understanding is a chain of sequential actions for extracting information

from a foreign text. It begins with the visual perception of a text or to be more exact a word.

Recognition of any word comes as a result of its comparison with an image which is a standard stored in the long-term memory of readers. On this basis its identification occurs. Then the visually perceived material is subjected to semantic processing. The meaning of the perceived unit is correlated with the meaning of the surrounding units, words are combined into syntagmas, syntagmas are correlated and combined into sentences, and sentences are combined into semantic pieces that form a coherent text (a word -> a syntagma -> a sentence -> a text).

Analyzing the neuro-linguistic nature of the speech message understanding process A.R. Luriya stresses three conditions under which its successful perception is possible. Firstly, the recipient "must perceive and understand individual *words* which are lexical units of speech... Secondly <...> one must understand the *structure* of the whole *sentence* which is a system composed of individual words that allow them to formulate the main idea. <...> Finally, once the individual sentences that make up the elements of the whole statement are understood, the decoding process proceeds to the last stage – the understanding of *the whole message*" (Luriya, 2002, p. 232-233).

Following the step-by-step nature of perception, we consider the algorithm of gradual training foreign language text comprehension to be the best method to be used in the process of teaching a foreign language at non-linguistic university.

Developing the method of teaching foreign language text understanding, we also relied on the doctrine of I.R. Gal'perin and his followers about the gradual formation of mental actions. The essence of this concept lies in the fact that "mental activity presents the result of the transfer of external material actions into the plan of ideas and concepts perception. Such transfer follows a series of stages. The process of reflection, actions and their systematic transformations take place at each stage" (Gal'perin, 1981, p. 46).

Since special technical texts are the object of learning comprehension in our study, we consider it appropriate to improve the structural chain that implements a communicative task of extracting professionally significant information from a foreign language text. So we replaced the concept of a *word* by a *term*. In this respect, it seems optimal to refer to the following blocks:

1st block – conscious work on *a term*;

2nd block – conscious work on *a sentence*;

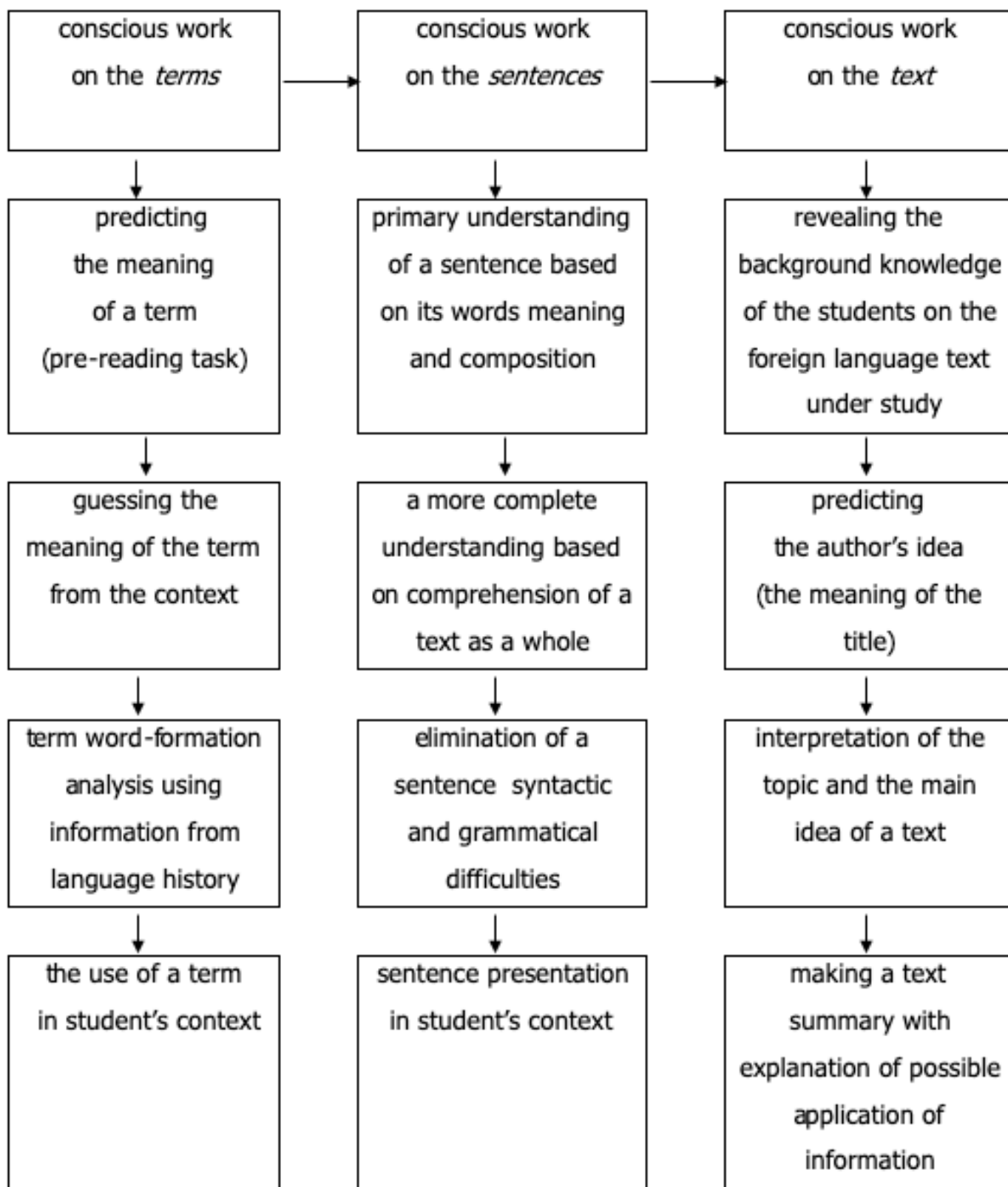
3rd block – conscious work on *a text* as a whole.

We relied on consciousness as the basic principle while teaching students foreign language text comprehension at non-linguistic universities. This goal was achieved by activating their reflective skills in the process of

working with the offered algorithms on the selected blocks (see Fig. 1).

**Fig. 1**

Algorithm of work on a foreign language text



This algorithm serves a practical guide to develop skills and shape notions. Thanks to this method a cognitive activity of students is enriched by consistency and structuring and it results in meaningfulness and "apprehensibility" of the mastering process.

The main principles of this methodological introduction into an educational process are relevance, reasonability, simplicity and productivity. The efficiency of these algorithms usage is significantly decided by their simplicity and availability, by analogy level of all model

description means in the common chain: a rule – algorithm – a scheme of verbal reasoning – a graphical capture of cognitive activities in the process of motivation.

The process of training with this algorithmic method usage is done on a three step basis. The preparatory phase is characterized by skills activation (the algorithm usage is based on them) and a new skill formation. Students are prepared to carry out elementary algorithmic procedures. The main phase is devoted to a rule analysis followed by the schematic algorithm record, simplifying its understanding and learning.

A part of individual work with the scheme is increased with each exercise. Gradually a direct appeal to the given algorithm seems to recede, indicating the beginning of a final phase – the phase of procedures reduction. Some procedures are carried out simultaneously, other ones – intuitively without any memory stress. Reduced comments and samples contribute to timely algorithm summarization (Galeev, 2011) and here we can speak about the process of skills automatization.

The next efficient method to achieve the main goal – to develop students' communicative competence of non-linguistic direction – is the lexical-grammatical mapping technique, representing one of up-to-date means of visual-graphical compression of foreign language material.

In the process of our pedagogical experiment we made it sure that professionally-oriented training of foreign languages at non-linguistic universities requires such learning-teaching models as the ones that are characterized by logically understandable and methodologically clear explanatory capacity, as well as by clear commitment to communicative competence development allowing students to use linguistic and cultural knowledge (obtained in the learning process) in their future profession, that might be an athletic-training sphere of a high international level.

The main object of such modeling is foreign language vocabulary that is being learnt: knowledge of professionally-oriented vocabulary, in our opinion, constitutes a significant part of skills and abilities of professionally-oriented foreign language communication. Professionally-oriented terminology knowledge, relating to sport sphere of concepts alongside with basic grammatical structures is a very important prerequisite to successful goals achievement of communicative competence development, that we analyzed in detail through the method of mapping lexico-grammatical material (Bgantseva et al., 2019).

The lexical-grammatical mapping technique originated by analogy to the semantic mapping technique, developed by K. Belousov, is a technique of semantic text structure analysis consisting of 1) text reading and theme defining; 2) micro-themes defining; 3) text words distribution into lexical-semantic groups according to distinguished micro-themes (Belousov, 2005). Semantic maps, in their turn, are a useful tool of linguistic grammar-lexical meanings analysis, efficient means of linguistic generalizations representation, and they have rather strong explanatory capacity (Tatevosov, 2004, p. 123).



Due to such rich methodological capacity and great opportunities in the process of foreign languages learning the idea to use the lexical-grammatical mapping technique allowing developing students' communicative competence seems to be reasonable. A lexical-grammatical map is a series combination of illustrative-schematic aids made for or by students to contribute to more efficient terms mastering in their future profession and to successful usage of active grammatical structures in speech.

Thus, this map represents a scheme / a speech sample / a visual aid for students and includes thematic work with necessary lexical items and grammatical structures to be learnt and frequently used in speech.

The process of lexical items and grammatical structures mastering with the help of semantic maps undergoes a range of phases with the goal of communicative skills development: 1) lexical items grouping on the principle of their reference to a particular theme aspect; 2) analytical memorization procedure through relevant exercises with the usage of lexical-grammatical mapping material; 3) cognitive understanding of lexical units meanings in the context of phrasal unity; 4) analytical-thinking procedures of intensification and establishment of acoustical and graphical words images correlation with visual images of objects denoted by them through visualization, that is with the help of composing semantic maps allowing to realize associative links between lexical units and with the situation itself, that is to reveal not only the meaning of words but their destination as well.

Sport-students' communicative competence development based on the lexical-grammatical mapping technique is carried out through the following steps:

1. Segmentation and fixing of communicatively-important lexical items and more frequently used grammatical structures.
2. Activation of communicatively-important lexical items and more frequently used grammatical structures.
3. Individual understanding of communicatively-important lexical items usage and more frequently-used grammatical structures in speech.

On the fixing phase there is a grouping of lexical items and grammatical structures by reference to particular theme and according to principles of their commitment to terminology vocabulary and usage frequency.

Activation of important professionally-oriented vocabulary and grammatical structures in students' speech is done by means of such exercises as: 1) exercises of simulation type, 2) exercises of substitution type, 3) exercises of definition type.

The next phase (usage of the lexical-grammatical mapping technique) there is a process of lexical skills mastering and perfection, aimed at cognitive identification – individual objects naming, interconnected by association; also it is characterized by training procedure of words recollection and ability to combine meanings and form a range of word links and their collocations. This phase of lexical skills formation is simply

words recall, based on differentiation links and it becomes quite reasonable usage of important professionally-oriented vocabulary in fluent speech by sentences and word-phrases.

The syntagma expanding technique also proved to be valuable in didactics that we frequently used in such an aspect of communication as reading. This speech activity takes one of leading roles in the process of foreign language teaching with respect to its usage, importance and availability; it serves both as educational goal and a means of classroom-based and an individual foreign language learning process.

Reading as a communicative competence development tool gains special interest in relation to the given target of students' communicative competence perfection. The Federal Educational Standard 3+ for students studying a foreign language at non-linguistic universities makes emphasis on the fact that a foreign language is an essential part of professionally-oriented training, if we speak about a modern-day specialist of any skills profile. For this reason, reading of foreign language periodicals, cross-cultural and professionally-oriented texts becomes one of the most significant spheres of foreign languages usage for a future specialist.

Thus, foreign language training is determined by specific characteristics of the future profession. Learning to read, students had a double motivation because this activity is not just one of the points of the University educational program, but also the opportunity to implement and improve their professional activities.

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## 5. Discussion

Psychologists S. Folomkina (2005), Z. Klychnikova (2003), I. Zimnyaya (1989), V. Zinchenko (1997), V. Znakov (2000) etc. believe that an experienced reader perceives text information by syntagmas, which means that the result of reading depends on the formation of mechanisms of syntagmatic perception and anticipation. Therefore it is very important to pay appropriate attention to the development of these mechanisms. In the process of teaching professionally-oriented reading, we focused on syntagma, which is an important means of text perception, as well as on the principle of fully comprehended extraction of accurate professionally-significant information, which led to the choice of the method of expanding syntagmas.

An expanding syntagma is a small statement that consists of 3-4 phrases and has logic and content connection. Each subsequent syntagma is longer than the previous one. All phrases group around one key word-term, which allows remembering the word and learning its meaning.

Let's apply expanding syntagmas method to one paragraph of the foreign language text on "Metallurgy and material processing technologies" to help students comprehend and assimilate the required term.

I. *Metal* is the basis.

*Metal* is the basis of civilization.

Nowadays *metal* is the basis of civilization.

Nowadays *metal* is the basis of civilization - it is impossible to imagine life without metals.

*Metals* are divided into ferrous and non-ferrous.

II. They are metals and *alloys*.

People use *alloys* not pure metals in industrial sector.

An *alloy* is a mixture of composed metallic properties.

The quality of an *alloy* depends on the presence or absence of a metalloid in it.

As the example shows, a syntagma is a word or a phrase that has an independent meaning in speech and expands in each subsequent phrase. It happens not directly, but it is transformed in the context of a given problem from the social sphere of human-science relations. However, when expanded, a keyword or a phrase is repeated in each phrase in combination with new words.

According to methodists E. Passov (2010), L. Landa (1964), E. Volkov (1999) etc., who describe the potentials of this method, believe that the work on word combinations blocks should precede reading and understanding the text, acquaint students with its key words and prepare them to the perception of certain topics and problems. Thus it helps to understand the meaning of a foreign language text at its first reading, as well as prepare students of science profile for a more detailed and deep understanding of it.

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## **6. Conclusion**

Expanding syntagmas can act as a means for achieving different goals, provide a complete, accurate and deep understanding of the meaning of a foreign text. They can be used to identify the peculiarities of the pronunciation of a term, combine a certain lexical unit with other words, and study the grammatical phenomena necessary for understanding the meaning of the text and so on.

The use of expanding syntagmas method let us:

- 1) carry out meaningful work on the 1st and 2nd blocks of our methodology, taking into account the above mentioned conditions;
- 2) ensure the compliance with the criteria taken as a basis for optimizing the process of learning to understand a foreign language professionally-oriented text "Technical science";
- 3) provide students with general algorithm to organize independent educational work, which allows them to learn lexical and grammatical structure of a foreign language text and understand its content by themselves.

The use of expanding syntagmas method allowed us to fulfil the main methodological factors identified for the work on the 1st and 2nd blocks

of our technique. They aim to prevent students from mechanical use of a dictionary and encourage an active work of a thought, semantic guess, overcoming the difficulties. In other words, they may lead to meaningful learning of the material.

The results of the pedagogical experiment showed that improving the students' efficiency in formation of professionally oriented foreign language communicative competence at non-linguistic University is possible on the basis of cognitive-systematic methodical compression method, the result of which is not only a set of skills in a foreign language, but also a set of system-structural algorithms of actions (see Fig. 2).

**Figure 2**  
Level of communicative competence development

Groups of students	Level of communicative competence development		Methods of communicative competence development
	before	after	
Students of the experimental group	30-35%	45-50%	algorithmization, lexico-grammatical mapping technique, expanding syntagms method
Students of the control group	20-25%	25-30%	

During the pedagogical experiment we introduced the communicative competence development technique in educational process of the students' experimental group. We based on the concept of cognitive-systematic training, implying the use of lexical and grammatical mapping technique, algorithmization of science sublanguage phenomena and expanding syntagmas method. The experiment involved 16 first-year students divided into two groups: control (7 people) and experimental (9 people).

The range of the communicative competence development is recorded in the experimental and control groups of students at the initial stage of the pedagogical experiment (before) and at its final stage (after) and is given in the table.

At the same time, the learning process in the control group took place

according to the program provided by the higher education institution on the basis of the curriculum, but according to standard methods.

It was established that the development of students foreign language communicative competence at non-linguistic university is carried out most effectively using lexico-grammatical mapping technique applied to educational material, expanding syntagmas and algorithmization methods. The percentage increase was 20-25%.

These methods implemented in the process of communicative competence development constitute the core constructs of methodical compression technique.

The above mentioned methods used by us for the development of communicative competence proved to be effective and productive, as we had an opportunity to see it in the end of the pedagogical experiment.

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