SCTCMG 2018

International Scientific Conference «Social and Cultural Transformations in the Context of Modern Globalism»

FUNCTIONING OF TERMS ON MATERIAL OF SPECIALIZED SCIENTIFIC TEXTS

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Abstract

This paper discusses the functioning of terms in the texts of natural sciences. The article describes the conditions (parameters) of the functioning of terms in the texts of the analyzed sciences. Representing the features of language scientific literature, analyzed in this article, the texts show a high degree of specialization that affects primarily on the intensity of their terms. The terms are analyzed by formality, by semantic criterion and by the scope of usage. We have identified the problem of the complexity of perception and understanding of specialized scientific texts by students. In this connection there is the need to analyze the functioning of the terms in the texts of scientific disciplines. The research question is studying the functioning of terms based on the material of specialized scientific texts using the following parameters: 1) formal criterion, 2) semantic criterion, 3) scope of usage of the terms. The following methods were used: analysis of studies devoted to the issue of terminology; linguistic analysis; lexico-semantic analysis; graphical method of presenting research results. After analyzing more than 100 scientific articles published in 2017-2018, we stopped at a detailed lexical-semantic analysis of those who, in our opinion, most clearly demonstrate the functioning of terms in these areas of scientific knowledge. Our study revealed that the most productive method of terminology in scientific texts on medicine, physics and mathematics turned out to be multicomponent terminological combinations.

Keywords: Scientific text, lexical unit, term, classification.

1. Introduction

At present, the issues of natural science terminology are becoming increasingly important due to the growth of international relations in the field of science and culture. The study of natural science terms is particularly interesting and important in view of the continuous development and enrichment of these sciences. And as a result of these processes, the terminological system of the scientific, technical and medical fields undergoes certain transformations. Thus, their study in various types of discourses, including the scientific text, acquires special significance.

Relevance of the work due to special social status of medicine, physics and mathematics, by which natural science terminology is currently receiving considerable spread in the modern Russian language, as well as in other languages. And this is natural, because the medicine, mathematics and physics occupy a leading position in the process of understanding the world.

2. Problem Statement

We have identified the problem of the complexity of perception and understanding of specialized scientific texts by students, in this connection there was the need to analyze the functioning of the terms in the texts of scientific disciplines and their comparison with the original scientific texts.

3. Research Questions

Functioning of terms on the material of specialized scientific texts.

4. Purpose of the Study

The study of the functioning of terms on the material of specialized scientific texts in terms of the following parameters: 1) formal criterion, 2) semantic criterion, 3) scope of usage of the terms.

5. Research Methods

When performing the study, the following methods were used: analysis of studies devoted to the issue of terminology; linguistic analysis; lexico-semantic analysis; graphical method of presenting research results.

6. Findings

The language of science is most often a combination of the artificial language and the natural one. The artificial language usually functions in the field of terminology and the designation of narrow concepts, while the language itself is assigned the role of an operator and a dispatcher (predicates, connectives, patterns of morphology and syntax). Such is the majority of modern languages of science and technology (sublanguages of biology, medicine, mathematics, physics, and geology). In our study, we consider scientific texts from the field of medicine, mathematics and physics. This selection is based on the most vivid demonstration of the functioning of terms in these areas.

Special text is the text, the main contents of which are certain theories, facts, information, recommendations of various sciences and fields of knowledge. Such texts include scientific, technical and

business texts. Such, for example, monographs, articles on medicine, physics, mathematics, textbooks for universities, and others. Thus, special scientific knowledge, undoubtedly, acts as the main factor in the formation of a scientific text. Such scholars as Bure, Bystrykh, & Vishnyakova (2003) characterize the scientific text as logical, precise, rigorous and informative. They note that the scientific text uses certain lexical and grammatical means, special structural schemes, logical organization of textual material, and terminology. The researcher Rozhdestvensky (1997) considers a scientific text (scientific prose - in the terminology of Rozhdestvensky) from the point of view of the composition of lexical units and presents it as a set of categories: terms, literary language words, scientific terminology and general scientific vocabulary. The common ground that unites scientists in the descriptions of a scientific text is terminology.

The analysis of works devoted to the question of terminology suggests that the term has been and is the subject of research by many linguists. The study of the term as the main type of special vocabulary and terminology as a set of terms was done by well-known experts in the field of the theory of linguistics B.N. Golovin, V.P. Danilenko, V.M. Leychik, Z.I. Komarova and others.

There are many ways to define a term, and therefore a large number of definitions of the term. We will cite only those that, in our opinion, are suitable for identifying the general definition of a term in our study.

The Big Encyclopedic Dictionary defines the term in this way: «The term (from the Latin terminus - boundary, limit) is a word or phrase denoting the concept of a special field of knowledge or activity». In Komarova (2012), we find the following definition of the term: « A term is an invariant (word or phrase) that means a special object or scientific concept limited to a definition and a place in a certain terminological system » (2012). In this definition, Komarova (2012) emphasizes the nominative nature of the term. M.N. Volodina defines the term as follows: «the term is understood as a word or a word combination of a special sphere of use, created (borrowed, accepted) for the exact expression of special concepts and based on the definition». The above definitions distinguish the following features of the term: 1) its nominativeness and 2) definitivity. Danilenko (1977) gives the following definition of the term: «The term is a word (or phrase) of a special sphere of use, which is the name of a special concept and requires definition». Golovin (1998) defines the term as: « a separate word or a subordinate phrase based on a noun, denoting a professional concept and intended to meet the specific needs of communication in a particular profession (scientific, technical, industrial, management)». In this definition, we see that the author emphasizes, first of all, the structural features of the term, which will be reflected in the classification of terms. As part of our research, we will adhere to the definition proposed by the Russian linguist, terminologist, lexicologist, lexicographer Leichik (2009). «The term is a lexical unit of a specific language for special purposes, denoting a general — concrete or abstract — concept of a theory of a specific special area of knowledge or activity » (Leychik, 2009).

As most linguists (A.A. Reformatsky, G.O. Vinokur, V.G. Gak, and others) point out, the term is characterized by a tendency to accuracy, unambiguity, and systemic nature, which distinguishes scientific terminology from everyday vocabulary. The following specific features of the term can be distinguished, namely: consistency, the presence of a definition (definition), uniqueness, stylistic neutrality, lack of expression, simplicity.

The main criteria put forward by the majority of researchers to carry out the terms of classifications are formal criterion, semantic criteria, and etymological criterion, use the scope, normative, chronological criteria.

Therefore it is necessary first of all to establish the criteria that most clearly demonstrate the functioning of the system in terms of studying the vocabulary of scientific texts context.

In our study, in the process of linguistic material analysis, we used the classification, which is the most deployed and most comprehensive in terms of division criteria on the types and contain some aspects that allow describing the conditions (parameters) of the operation terms. So, we are interested in the classification of Leichik (2009), where the scientist was guided not only by the linguistic criterion, but also by such principles as the typology of terms, field of knowledge, logical category, degree of abstraction, authorship, functions in science, frequency of occurrence in the text, normativity of the term, its relation to modernity, belonging to the part of speech.

Another classification of terms is presented by Grinev (1993). The scientist proposes to classify the terms according to several criteria - the type of concepts they call, the degree of their abstraction, the place in the hierarchy of concepts and from the subject affiliation; semantic structure, coincidence or opposition of meanings, proximity of meanings and forms, phrases. However, this classification does not define the parameters for the functioning of terms that we need, although it gives a complete classification of terms according to a formal feature (Grinev, 1993).

Let us consider each criterion separately in more detail:

Formal criterion

In the linguistic classification V.M. Leichik identifies the types of terms according to the formal structure: terms-words, terms-phrases, terms-abbreviations, and terms-symbols.

In the classifications of V.M. Leichik and V.P. Danilenko traced some similarities. Namely, V.P. Danilenko identifies three structural types of terms:

I. Terms-words: non-derivatives, derivatives, complex, abbreviations;

II. Terms-phrases: decomposable, indecomposable - terms-phraseological units, symbols-words (Danilenko, 1977).

Semantic criterion

Leychik (2009) considers the types of terms with respect to the semantic criterion as follows: unambiguous terms, polysemous terms, terms-free phrases, and terms — stable phrases.

We cannot say about the classification of the founder of the Russian terminology D.S. Lotte, who, in his classification of terms, divides them according to the semantic criterion into: valid or unambiguous terms; terms, synonyms or plural; polysemantic or meaningful terms; undifferentiated terms; descriptive terms (Lotte, 1961, Lotte, 1968). According to Leychik (2009), speaking of the criterion of motivation, the terms can be divided as follows: motivated terms; fully motivated; partially motivated; unmotivated; falsely motivated. In our opinion, the above presented classification of Leychik (2009) on the principle of motivation is exactly the same as that represented by Grinev (1993).

Graudina and Shiryaev (1998) also, in turn, distinguish terms by the degree of their motivation, denoting only 2 types of terms: motivated (or orienting), unmotivated (among which are falsely motivated, familial (eponym terms), term elements).

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Etymological criterion is well represented in the classifications of works by A.A. Reformatsky, S.V. Grineva, however, this is material from another study.

We have reviewed and analyzed the main criteria for the classification of terms. But there are other criteria that are often used by the authors at the heart of their classifications, for example, the scope of use of the term, which implies the area of knowledge and the scope of use of the term in science.

In relation to this criterion from the point of view of the called concepts S.V. Grinev divides the terms into: general scientific terms, general technical terms; intersectoral terms; industry terms; industry-specific terms; highly specialized terms (Grinev, 1993). According to the field of usage A.A. Reformatsky offers a slightly different classification, highlighting the following types of terms: terms within the same terminology; terms within various fields of science; common words that have specialized meaning (Reformatsky, 1967; Reformatsky, 1986). Guided by the criterion of belonging to a particular field of science L.N. Graudina and E.N. Shiryaev, divided the terms into: commonly used and professional (Graudina & Shiryaev, 1998; Yartseva, 1998). The category of normativity is considered in their classifications by scientists such as V.M. Leychik, Z.I. Komarov. The chronological criterion is described in the Grinev's classification. However, these classifications are beyond the scope of our study.

Thus, the classification of terms is carried out using various criteria: formal, semantic and etymological, belonging to a particular field of science, normativity, chronological criteria, etc. Due to the fact that we were tasked to consider the functioning of terms in a scientific text, Let us dwell in more detail on three criteria. The selected terms were analyzed in terms of the following parameters: 1) a formal criterion, 2) a semantic criterion, 3) the scope of use of the term.

During the study of language material, the following algorithm was used:

1) to select terms in a specific scientific area (« Physiology of visceral systems», « Application of mathematical research methods in other fields of knowledge » and «Physics of the condensed state»);

2) to classify the terms according to the classification adopted as a basis in this study;

3) to consider the use of terms in context (in scientific texts);

4) to compare the presented set of terms of a certain scientific direction by the frequency of use in the analyzed level of the language;

5) to compare the analyzed scientific directions, draw conclusions

Linguistic analysis was carried out by us on the material of terminology used in scientific texts in the field of mathematics, physics and medicine. After analyzing more than 100 scientific articles published in 2017-2018, we stopped at a detailed lexical-semantic analysis of those who, in our opinion, most clearly demonstrate the functioning of terms in these areas of scientific knowledge. The number of words in the analyzed articles ranged from 800 to 3000 words. The results of the study of the lexical composition of scientific texts led us to the conclusion about the high degree of their specialization. All texts analyzed in our study are intended for a professional target audience. As part of the study to demonstrate the functioning of our terminology 2 articles on medicine and 2 article of physico- mathematical cycle have been selected.

The first article «Features of cerebral non-dynamics depending on the localization of the transition zone in the ECG chest leads» (Tovmasyan, Sevryukova, Isupov, Bocharova, & German, 2008). The article

contains 800 words. The structure of the scientific text being analyzed includes 141 terms (17.63% - the percentage of the frequency used terms in the total number of words in the text).

The second article « Expiratory pulmonary volumes of young people in conditions of rest and in the recovery period after measured physical activity » (Isupov, Sevryukova, Shmarina, Ryaskova, & Belova, 2017). This scientific text contains 1512 words, of which 150 words are terms, which is 9.92% (percentage of the frequency of the number of words).

The third article «Periodic and non-periodic finite sequences» (Chirsky, 2009) was published in the scientific and theoretical journal MINOBRNAUKI of the Russian Federation and ANRI. This number is 17, 54% (percentage of frequency of the number of words).

The fourth article «Generation of direct current in two-layer graphene in a bichromatic electric field» (Kukhar, Kryuchkov, & Ionkina, 2016) This article contains 895 words, of which 176 are terms, which is 19, 66% (percentage of the frequency of the number of words).

So, according to the presented criteria, we will demonstrate the functioning of terms in the analyzed texts according to a formal feature. The study showed that the active group of terms are terms-words and term-phrases. A small group of terms are terms-symbols, and they are much more in texts on physics and mathematics, and less on medical ones. Detailed information on the formal characteristic of the classification of terms found in scientific texts is presented in the Figure 1:
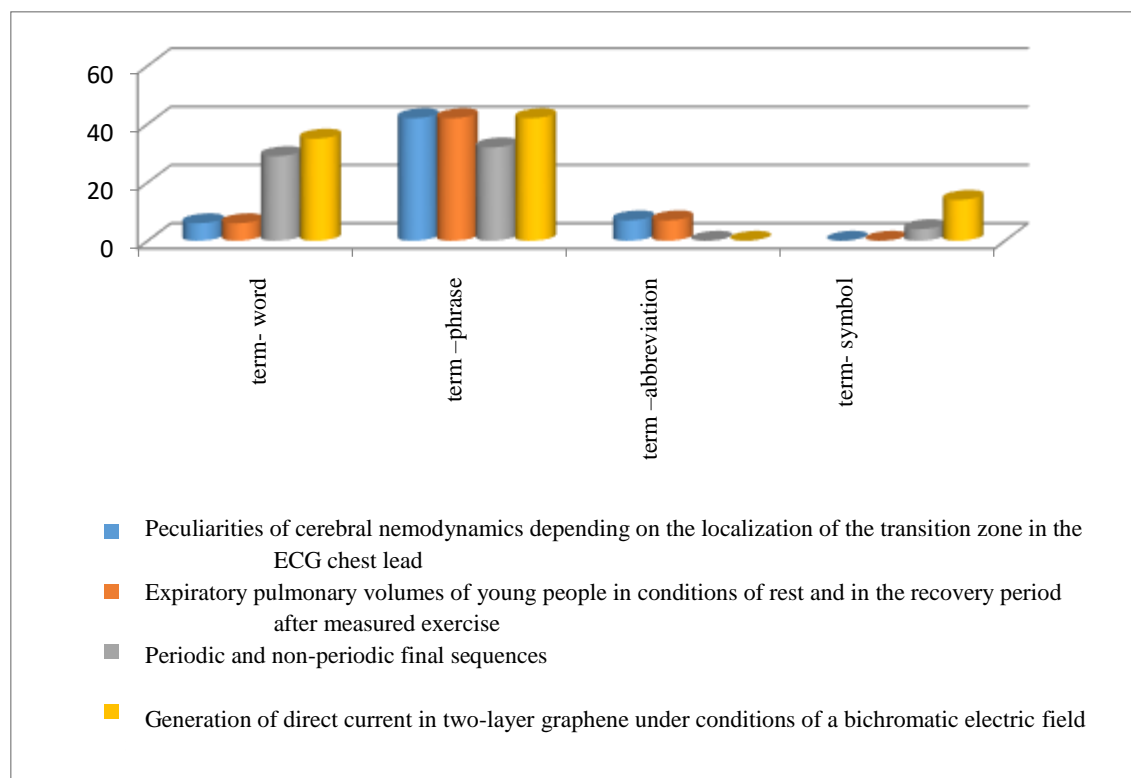

Figure 01. Indicators by the formal criterion.

As noted above, in the article «Features of cerebral nemo-dynamics depending on the localization of the transition zone in the ECG chest leads » (Tovmasyan, Sevryukova, Isupov, Bocharova, & German, 2008) contains 141 terms. As the diagram shows, a larger number of terms are term- phrases (76.36% of

the number of terms). Basically, it is a phrase consisting of two words. In the text, you can find both the phrase "adjective + noun" (impulse activity, process test, venous outflow), and the phrase "noun + noun (myocardial section, blood release). In the analyzed scientific text there are also more complex phrases consisting of three (abbreviation fronto-mastoid) and four (histohematic metabolism) terms. In the text, you can select the terms-words (10.91% of the number of terms), for example, tone, orthostasis. As the diagram shows, in the scientific article there are no terms-symbols at all, however, abbreviation terms in sufficient quantity (12.73% of the number of terms). This frequency of use of terms can be explained by the specifics of the medical text.

In the next article «Expiratory pulmonary volumes of young people in conditions of rest and in the recovery period after measured exercise» (Isupov, Sevryukova, Shmarina, Ryaskova, & Belova, 2017) we can see that the authors more often use the terms-phrases - respiratory rate, respiratory cycle (68.42% of the number of terms), less often the word-terms hypodynamia, muscles (17, 54% of the number of terms), even less abbreviations – LC (lung capacity) - (12, 28% of the number of terms), there are no terms-symbols, and only 1, 75% - word-symbols (t-criterion Martin).

The study of the functioning of terms in the language of exact sciences showed that the third article «Periodic and non-periodic finite sequences» (Chirsky, 2009) contains an approximately equal ratio of term-words (44.62% of the number of terms) and term-phrases (49, 23% of the number of terms). Mathematical terms (such as period, non-periodicity, sought, divisor, fraction), as well as term combinations (irrational number, polyadic numbers, and more complex ones: an infinite sequence of numbers, a fraction with a limited partial quotient) are an exact definition of a scientific concept. In this article, there are no abbreviation terms, and, of course, you can select terms-symbols (6.15% of the number of terms), for example (delta), (omega).

In the texts of the sublanguage of physics, the terms of a specific formal structure are constantly found with the use of elements of artificial languages. The analyzed scientific text of the next scientific article is no exception. In the fourth article «Generation of direct current in two-layer graphene under conditions of a bichromatic electric field » (Kukhar, Kryuchkov, & Ionkina, 2016), you can see symbols-words, for example, approximation, and if in the previous scientific article this is the exception rather than the rule, then in articles on mathematics and physics it is quite a frequent occurrence. Here we also see an insignificant quantitative difference between the term-words (38.46% of the number of terms) and the term-phrases (46.15% of the number of terms). Among the latter, quite often there are phrases consisting of three or more words, for example, the equilibrium distribution function, a free charge carrier, external transverse voltage, etc.

Our study revealed that the most productive method of terminology in scientific texts on medicine, physics and mathematics turned out to be multicomponent terminological combinations. Multicomponent terminological combinations are the best language tool in the field of modern terms. The predominant methods of forming the terminological vocabulary of the natural sciences are two- and three-component terminological combinations. We note the frequency of use of nouns in the analyzed scientific texts in combination with adjectives in the definition function, which can be explained by the brevity of such a multi-component combination and high informational content, which is very important for scientific presentation. We were interested in the semantic criterion from the point of view of the integrity of lexical

meaning, lexical cohesion in multi-component terminological combinations (decomposability-in decomposability of the word combination - classification by V.P. Danilenko). In the analyzed scientific texts we have a small percentage (3% of the number of terms) the so-called phraseological units, correlated with a scientific concept. So, in the article « Expiratory pulmonary volumes of young people in conditions of rest and in the period of recovery after measured exercise» (Isupov, Sevryukova, Shmarina, Ryaskova, & Belova, 2017) there is a phraseological phrase - hardening pressure. However, it is worthwhile to indicate the presence in the texts of phraseological units used in all styles of the language, for example, to give up attempts, to analyze. Detailed information on the semantic attribute of the classification of terms found in scientific texts is presented in Figure 2.

We note the fact that terminological phraseology has absolute precision, unambiguity in any scientific context.

Phraseological means of any text include expressiveness and figurativeness; the scientific text is no exception. The most characteristic of the texts analyzed by us are the means contributing to the transfer of logical-mental relationships between complex units of text. For example, articles in the physics and mathematics direction contain expressions in which the meaning of a concept is built on the basis of metaphorical transference, which, it would seem, is not characteristic of a scientific text: «… combination of numbers « slightly diluted in other numbers » or « shear stress … plays the role of a kind of « key ». Such metaphors do not have a systemic nature and are used by the authors, among other things, in order to increase the level of understanding of the material presented.
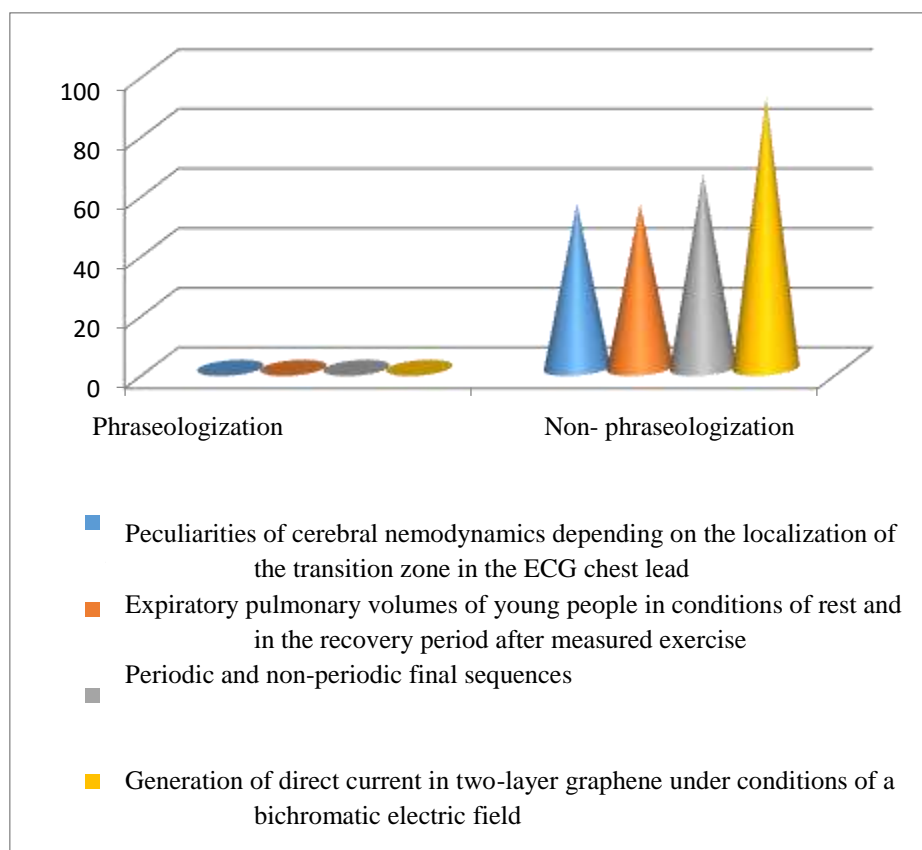

Figure 02. Indicators by semantic criterion.

According to the semantic criterion, among the terms analyzed in this study, terms that have one meaning prevail. Indeed, the term is usually perceived as a word or phrase denoting the concept of some special field of knowledge or activity. However, we note the fact that often there are terms that have a variation of meanings, depending on the sphere of use. The phenomenon of polysemy of the term, we observe in the materials of this study. For example, the term «decomposition » or «operation» in different areas of science will have different meanings.

Let us consider the subject matter of the term. All terms are words that are broadcasting their specific scientific information in the scientific text, so according to the classification of L.N Graudinoy, E.N. Shiryaeva, we analyzed the terms in the sphere of use, i.e. their functioning as common and professional terms. In Diagram 3, we can observe the prevalence of special and highly specialized terms in relation to general scientific. You can also note the fact that the scientific text «Generation of direct current in two-layer graphene in a bichromatic electric field» contains a small number of mathematical terms, among which are mostly the terms symbols (which indicates the saturation of texts with narrow special terms (78 units), and only 13 units - general scientific terms), and a large number of terms on «Condensed Matter Physics». General scientific terms in the analyzed texts are a bit. The article «Periodic and non-periodic finite sequences» (Chirsky, 2009) contains 52 special terms and 13 general scientific terms. In the article «Peculiarities of cerebral non-dynamics depending on the localization of the transition zone in the ECG chest leads » (Tovmasyan, Sevryukova, Isupov, Bocharova & German, 2008). There are 51 special terms and 4 general scientific terms. In the next medical article «Expiratory pulmonary volumes of young people at rest and during recovery after dosed physical activity » (Isupov, Sevryukova, Shmarina, Ryaskova, Belova, 2017) we see that the authors also use special terminology (52 units). Thus, these indicators of the number of terms lead us to the conclusion that the analyzed scientific texts will be available for understanding only to a narrow circle of scientists specializing in this field, and are not available to a wide circle of readers.
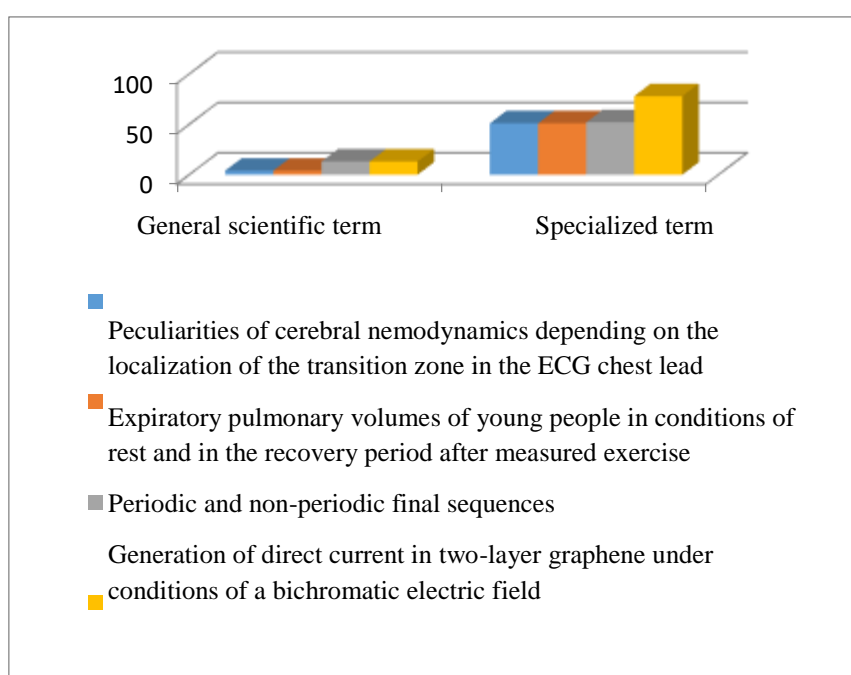

Figure 03. Indicators of field use

7. Conclusion

Our study revealed that the most productive method of terminology in scientific texts on medicine, physics and mathematics turned out to be multicomponent terminological combinations. Multicomponent terminological combinations are the best language tool in the field of modern terms. The predominant method of forming the terminological vocabulary of the natural sciences is two- and three-component terminological combinations. It should be note the frequency of use of nouns in the analyzed scientific texts in combination with adjectives in the definition function, which can be explained by the brevity of such a multi-component combination and high informational content, which is very important for scientific presentation. The study of terms on a formal basis showed that the active group of terms are terms-words and word-combinations. A small group of terms are terms-symbols, and there are significantly more of them in texts on physics and mathematics, and less on medical ones.

According to the semantic criterion, among the terms analyzed in this study, terms that have one meaning prevail. Indeed, the term is usually perceived as a word or phrase denoting the concept of some special field of knowledge or activity. However, we note the fact that often there are terms that have a variation of meanings, depending on the sphere of use.

Indicators of the number of terms from the point of view of the scope of their use lead us to the conclusion that the analyzed scientific texts will be available for understanding only to a narrow circle of scientists specializing in this field and are not available for a wide circle of readers.

In general, the above results of the study of the functioning of terms lead us to the conclusion that within the scientific field, (whether it is «Physiology of visceral systems », «Application of mathematical research methods in other fields of knowledge» or «Physics of the condensed state»), the terminology accurately reflects the content this area of science.

Thus, the special scientific knowledge contained in terms, undoubtedly, is the main factor in the formation of a scientific text. A greater number of terms considered in this study function exclusively in a specific area of scientific knowledge.

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