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ANALYSIS OF THE SCIENTIFIC TEXT IN PSYCHOLINGUISTICS: AN OVERVIEW AND SOME PRELIMINARY FINDINGS

This article is devoted to an urgent problem for modern linguistics – the issue of understanding and perception of a scientific text in the large-scale space of information and education. The study is a review and analytical character with an attempt to consider the features of a scientific text and the related problems of perception and understanding of scientific information, and to outline possible ways to overcome the emerging communication difficulties. The article provides an overview of the psycholinguistic research of scientists-specialists in the field of semantic perception of the text, considers the specificity of the process of understanding a scientific text as a complex specific type of text. Today the writing of a scientific text, namely scientific articles, is an urgent problem in the academic communication of the republic, due primarily to the requirements for such publications. Nowadays in order to obtain a PhD degree, a young researcher must be published in international journals included in the Scopus database and Web of Science. Such requirements apply not only to doctoral students, but also to teachers of domestic universities. Kazakhstan seeks to enter the international academic space so that domestic scientists are recognizable and cited, while researchers are faced with such problems as writing a text that meets international standards and requirements for this kind of scientific publications, selection of methods, keywords, and perception and understanding of the scientific text by the reader, reviewer, etc.

Key words: text, scientific text, understanding and perception of the text, psycholinguistics.

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Психолингвистикадағы ғылыми мәтінді талдау: жалпы шолу және алдын ала тұжырымдар

Мақала қазіргі тіл білімі үшін өзекті мәселе – кең ауқымды ақпарат және білім кеңістігіндегі ғылыми мәтінді түсіну және қабылдау мәселесіне арналған. Зерттеу ғылыми мәтіннің ерекшеліктерін және ғылыми ақпаратты қабылдау мен түсінуге байланысты мәселелерді қарастыруға, сондай-ақ пайда болатын коммуникативті қиындықтарды жеңудің мүмкін жолдарын анықтау мақсатында аналитикалық сипатқа ие. Мақалада мәтінді семантикалық қабылдау саласындағы маман ғалымдардың психолингвистикалық зерттеулеріне шолу жасалып, ғылыми мәтінді мәтіннің күрделі нақты бір түрі ретінде түсіну процесінің ерекшелігі қарастырылады. Бүгінгі таңда ғылыми мәтінді, атап айтқанда, ғылыми мақалаларды жазу біздің еліміздің академиялық кеңістігінде өзекті мәселе болып табылады. Ғылыми дәреже алу үшін жас зерттеуші Scopus, Web of Science мәліметтер базасының тізіміне кіретін халықаралық журналдарда міндетті түрде жариялануы тиіс. Бұл талаптар тек білім алушыларға ғана емес, сонымен қатар біздің ЖОО оқытушыларына да қатысты. Қазақстан отандық ғалымдар танымал болуы және дәйексөз алуы үшін халықаралық академиялық кеңістікке енуге ұмтылады, бұл ретте зерттеушілер осындай ғылыми жарияланымдарға қойылатын халықаралық стандарттар мен талаптарға сәйкес келетін мәтін жазу, әдістерді, негізгі сөздерді іріктеу, сондай-ақ оқырманның, рецензенттің ғылыми мәтінді қабылдауы мен түсінуі және т. б. сияқты проблемаларға тап болады.

Түйін сөздер: мәтін, ғылыми мәтін, мәтінді түсіну мен қабылдау, психолингвистика.

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Анализ научного текста в психолингвистике: обзор и некоторые предварительные выводы

Статья посвящена актуальной проблеме понимания и восприятия научного текста в глобальном информационно-образовательном пространстве. Исследование носит обзорно-аналитический характер с попыткой рассмотреть языковые особенности научного текста и

связанные с ними этапы и проблемы восприятия и понимания научной информации, а также наметить в перспективе возможные пути преодоления возникающих трудностей. В статье осуществлен обзор психолингвистических исследований ученых-специалистов в области смыслового восприятия текста, рассмотрена специфика процесса понимания научного текста как сложного специфического типа текста. Как показал анализ, на сегодняшний день написание научного текста, а именно научных статей является актуальной проблемой в академической коммуникации республики, обусловленной, прежде всего, требованиями, предъявляемыми к такого рода публикациям. Как известно, сегодня для получения степени доктора PhD молодой исследователь обязательно должен публиковаться в международных журналах, входящих в базу данных Scopus, Web of Science. Такие требования касаются не только докторантов, но и преподавателей отечественных вузов. Казахстан стремится войти в международное академическое пространство, чтобы отечественные ученые были узнаваемы и цитируемы, при этом исследователи сталкиваются с такими проблемами, как написание текста, соответствующего международным стандартам и требованиям, предъявляемым к такого рода научным публикациям, отбора методов, ключевых слов, а также восприятия и понимания научного текста читателем, рецензентом и др.

Ключевые слова: текст, научный текст, понимание и восприятие текста, психолингвистика.

Introduction

A text is a more complex semantic-structural system, which has its own characteristics and patterns. Since all language units are activated via text, it belongs to a particularly complex language symbol. In this regard, the analysis and recognition of text, the differentiation of its formation and structure, the definition of the function of linguistic units in text formation are becoming relevant today.

Textology researchers consider a literary text from the point of view of the skillful use of linguistic units in literary texts for the author's style purposes. These issues are only studies that related to literary text. And the studying the issues about the scientific text and its basic concepts, its characteristic features began only in the following years. In this regard, it is worth to mention the works of Kazakhstan authors like S. Koyanbekova, Alizhanov S., Uali N., Yesinbayeva Zh., and foreign linguists as Frank Smith, Ruth A. Berman, Cook L., Mayer R. and others. The article summarizes some characteristic of a scientific text arising from the requirements of the scientific style, features of the use of language means in scientific speech (Yesinbayeva, 2009: 36-40). If we take into account the diversity and versatility of the text, then it should be remembered that a scientific text, in turn, differs not only in the absence of general laws applicable to all types of text, but also in its semantic character, as well as in the ways of presentation.

The complexity and multidimensionality of the "text" phenomenon provides a multi-perspective approach to its analysis, which determines the subject of research not only for philologists, literary scholars and linguists, but also for psychologists, sociologists, and culturologists. A deep analysis

of scientific literature on text and textual activity is presented in the works of N.V. Rafikova (Mohamed) (Rafikova, 1999: 144), who is noting the focus of psycholinguistic research on the study of the interaction of the producer / recipient and the text, it means on the study of the life of the text in the individual consciousness, which is reflected in the study of the reader's projection of the text, its power and depth, which depend on the characteristics of the thesaurus of a native speaker. Various issues of psycholinguistic research of the text and the processes of its understanding by recipients are discussed in the books, where the corresponding chapters are specially highlighted. A new approach to the study of text and its projection is implemented in the works of A.A. Zalevskaya, who examines the text from the standpoint of the concepts of the internal lexicon of a person and the specifics of individual knowledge (Zalevskaya, 1988: 95). In the course of reading the text, interaction between the author and the reader takes place, therefore, according to Yu.A. Sorokin, it is important to study the triad «author – recipient – text» (Sorokin, 1988: 52). In contrast, A.A. Zalevskaya proposes to consider a system of five components: «the author – the author's projection of the text – the body of the text – the recipient – the projection of the text by the recipient». It is emphasized that only one of these components (the body of the text) is constant, since even the author, physically remaining one and the same person, can nevertheless perceive and interpret his own text in a different way. It is possible to distinguish between the specifics of the linguistic and psycholinguistic approaches to the text. Linguistics is interested in the text, which is studied as a product of the author's activity. For the psycholinguist, the text itself acts as an interaction between the "body of

the text” and the person. Psycholinguistics studies the projection of the text from the author and the reader, i.e. the mental form of the text («the image of the content of the text»), which exists only in the mind of a person. To create a text projection, all the richness of a person’s individual experience is used in various forms and manifestations (including in forms described as emotional and evaluative experiences, aesthetic feelings, frames, schemes of situations, denotations, images of different modalities, pragmatic knowledge, etc.).

Material and methods

Survey design, implementation and ethics. A pilot survey of both students and researchers was designed to answer the following lines of enquiry for both students and researchers:

How frequently did participants read scientific papers?

How did participants feel about reading scientific papers?

How easy to read did participants find different sections of papers?

How important did participants think different sections of papers were?

[Students only] How much training had they had in reading papers?

[Researchers only] What advice would they give to someone reading a paper for the first time.

In the pilot experiment, it is planned to conduct this questionnaire among undergraduates and researchers of the Faculty of Philology and World Languages, since writing scientific articles is one of the main requirements for obtaining an academic degree and certification of a researcher. As a result of the survey, it is planned to draw up correct and effective strategies for understanding and processing the scientific text, and then compile and write author’s own final product.

At this stage, we have reviewed scientific articles on the “Eurasian Journal of Philology: Science and Education” website (www.philart.kaznu.kz). The articles submitted for review were selected as the material. The most frequent mistakes were: non-compliance with requirements, lack of words in the abstract, a large number of keywords, incorrect design of the list of literature, repeated submissions to the site.

Reading is considered in our work as a complex psycholinguistic process, in this regard. Here we stick to the concept Kenneth S. Goodman, who considers the reader as following: “the reader is viewed as a user of language who processes three

kinds of information, grapho-phonetic, syntactic, and semantic, as he reacts to the graphic display on the page” (Kenneth, 1969).

As the main methods of psycholinguistic analysis of scientific text we highlight general scientific methods (observation, introspection) and methods and techniques of sociolinguistics (interview, survey, and interpretation), psycholinguistic methods (laboratory experiment), eye-tracking method, gradual scaling method, sentence completion method.

Literature review

We are interested in a psycholinguistic approach to the problem of understanding the text and modeling the understanding. As psycholinguistics (hereinafter – PL) developed, researchers’ views on the problem of understanding speech and text changed. The early period of the development of psycholinguistics is characterized by an emphasis on syntactic issues associated with modeling the paths of transition from a “surface structure” to a “deep structure”; in this case, the analysis on the directly components, the calculation of the “depth” of the phrase, etc., was carried out at the sentence/statement level. The task of PL researches was seen at that time in checking the “psychological reality” of linguistic or logical constructions (Leontyev, 1974: 21). In parallel with the strengthening of the role of the cognitive direction in the development of world science and the transfer of focus from syntax to semantics, and also with the formation of text linguistics and machine modeling of the intelligence work as specific areas of study, there was a reorientation of PL experiments to the search for factors, directing the understanding of the text, the identification of strategies of the subject perceiving the text, the study of communicative difficulties and ways to overcome them, etc. There was a transition from syntactic models to strategic models, from interpretative theories to constructive theories. From the latter point of view, “the statement is more of a key to the design of the model than a drawing on which it could be built” (Zalevskaya, 2005: 248: a reference to the statement of F. Johnson-Laird). An extensive array of observations and experimental data has been accumulated, indicating that in accordance with the general laws of mental activity, the individual sees in the text primarily what he expects or wants to see, what his motives, situation, emphasis, personal guidelines and much more aim at. It has been established that a special role in understanding the text is played by the ability of a

person to rely on schemes of knowledge about the world (frames, scripts, cognitive maps, etc.), which allow you to navigate the situation, complete it, judge the plausibility or unreality of what is described in the text. It is also widely understood that the understanding of the text, like its description, should be embodied in the propositions. The mechanism of semantic perception in the interpretation of I.A. Zimneya was widely recognized (Zimneya, 1976: 5). According to this theory, on the basis of the identification of a word, a decision is made on the semantic link (synthagma, two-word combination), i.e., on the proposition, and then on the connections between semantic links, after which the “semantic formation” phase is carried out, which “consists for the listener in generalizing the result of all this perceptual thought work and translating it into one whole, undivided unit of understanding slave. In our understanding, this is an internal program of speech utterance, which at the same time can be a constant (invariant) link when translating an utterance from one language to another. Some authors emphasize that the object of perception (text), the subject of perception (recipient) and the process of perception (Kuzmenko-Naumova, 1980: 79) should be distinguished, more precisely, it is necessary to study the understanding of the text taking into account the specific features of each of them when interacting a number of factors in different conditions. The attention of researchers is also attracted by the role of precedent phenomena (situations, names, statements, texts) in understanding the text. These aspects are considered by N.D. Burvikova, D.B. Gudkov, G.F. Kovalev, V.G. Kostomarov, V.V. Krasnykh, T.V. Postnova, G.G. Slyshkin and others. Discussing the process of understanding speech or text outside the framework of any certain model, we can conclude the following: in psycholinguistics there is still no single view of the problem of understanding speech, but in general, modern research is increasingly moving into the field of extralinguistic knowledge of the individual and into the sphere of mental processes.

Frank Smith, prominent English psycholinguist, defined two sides of reading in his work “Understanding Reading: A Psycholinguistic Analysis of Reading and Learning to read”: visual information and nonvisual information (Smith, 2004: 369). Reading is not an activity that can be conducted in the dark. To read you need illumination, some print in front of you, your eyes open, and possibly your spectacles on. In other words, reading depends on some information getting through the eyes to the brain. This can be called visual information.

It’s easy to characterize the general nature of visual information—it goes away when the lights go out. Access to visual information is a necessary part of reading, but not sufficient. You could have a wealth of visual information in a text before your open eyes and still not be able to read. For example, the text might be written in a language you don’t understand. Knowledge of the relevant language is essential for reading, but you can’t expect to find it on the printed page. Rather it is information that you must have already, behind the eyeballs. It can be distinguished from the visual information that comes through the eyes by being called nonvisual information or “prior knowledge”. There are other kinds of nonvisual information apart from knowledge of language. Knowledge of subject matter is equally important. Give many people an article on deconstructionism, subatomic physics, or the differential calculus, and they will not be able to read – not because of some inadequacy in the text, which specialists can read perfectly well, nor because there is anything wrong with their eyes, but because they lack appropriate nonvisual information. Experience in reading is another kind of nonvisual information of evident importance in making reading possible, although it has nothing to do with the lighting, the print, or the state of one’s eyes. Nonvisual information is easily distinguished from visual information – it is carried around by the reader all the time; it doesn’t go away when the lights go out. The distinction between visual and nonvisual information may seem obvious; nevertheless, it is so critical in reading and learning to read that I put it into diagram form (Fig.1) (Smith, 2004: 244). The reason that the distinction between visual and nonvisual information is so important is simply stated – there is a reciprocal relationship between the two. Within certain limits, one can be traded off for the other. The more nonvisual information a reader has, the less visual information the reader needs. The less nonvisual information that is available from behind the eyes, the more visual information is required. This reciprocal relationship is represented by the curved line between the two kinds of information in Fig. 1. Reading always involves a combination of visual and nonvisual information. Informal demonstrations of the trade-off between the two sources of information are not difficult to give. Popular novels and newspaper articles tend to be easy to read – they can be read relatively quickly, in poor light, despite small type and poor quality printing. They are easy to read because of what we know already; we have a minimal need for visual information. On the other hand, technical materials or difficult novel -or even the

same material when read by someone not as familiar with the language or the conventions of the text – require more time and more effort, larger type, clearer print, and superior physical conditions. The names of familiar towns on traffic signs can be read from further away than the same size place names of unfamiliar localities. It is easier to read letters on a wall when they are arranged into meaningful

words and phrases than the same size letters in the random order of an optometrist’s test chart. In each case the difference has nothing to do with the quality of the visual information available in the print but with the amount of nonvisual information that the reader can bring to bear. The less nonvisual information the reader can employ, the harder it is to read.

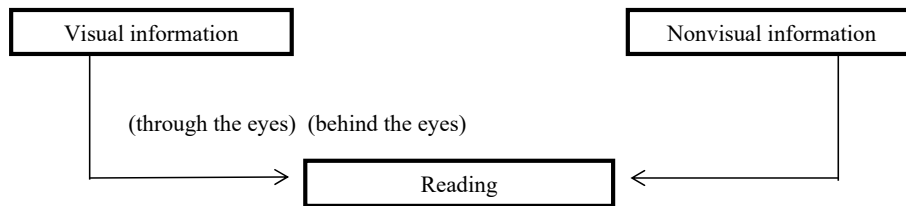


Figure 1 – Two sources of information in reading

The means of organizing scientific knowledge, the methodological basis of the scientific text are concepts (abstract names), the properties of which differ significantly from the names of the subject: the predominance in the semantics of generalization, moreover, of a rather high level, distraction from material traits (“denomination-free vocabulary” according to B. Russell); complexity of conceptual structures reflecting the stage of knowledge of the world (isolation and identification of connections and relations between fragments of reality, comprehension of causal dependencies, etc.), which finds expression in the onomasiological structure of abstract names: propositional significance, realization in the proposition of the connection of two quantities, features; compositional complexity, secondary, derivative (Kubryakova, 2006: 6). “Abstraction and generalization of thought are distinct from abstraction and generalization of things. This is not a further movement in the same direction and not its completion, but a transition to a new and higher plan of thought” (Vygotsky, 1982: 279).

Therefore, the understanding of the scientific text is a complex cognitive activity of the subject, conceptual thinking is necessary for the effectiveness of a sufficiently high level of development of verbal-analytical thinking. The depth of understanding of a scientific text depends on the formation of a psychological mechanism for processing semantic information, including operations of analysis and synthesis, classification, generalization and abstraction, folding and deployment of the meanings of the text.

In addition to the individual psychological characteristics of the subject, there are objective factors that determine the conditions for the development of thought operations necessary for adequate perception of detailed text information. Under the influence of modern mass communication, a “new image communicative mentality” is being formed, as V. G. Kostomarov defined it, reflecting the changes that are taking place today in the mass, and therefore in the individual linguistic consciousness:... “The current world is generally becoming “less linguistic “<... >. It is becoming increasingly difficult for our generation to fully perceive information that is not supported by image, color, movement by sound. According to available data, a whole generation of young people is already incapable of real reading, considering the usual non-special <... > and even more so special book texts (which is why they lose their ability to professional training) <... > unfailingly difficult, unpleasant, boring” (Kostomarov, 2005: 213-215). These changes, no doubt, further strengthen the role of visual thinking that dominates ordinary consciousness, impeding the development of conceptual, verbal-logical consciousness. Thus, the problem of perception (interpreted as an act of cognition, experience) and understanding of the scientific text, questions regarding the prerequisites, conditions and mechanisms for the implementation of this process, do not lose their relevance (Nurullina, Usmanova, 2018: 73). Communicative difficulties encountered in working with scientific material justify the need to find strategies to overcome them.

Summarizing the above, we outline three, in our opinion, main reasons for the misunderstanding of the scientific text: the complexity of the encoded meaning, the complexity of the language code and the limited capabilities of the subject of speech. These reasons reflect the essence of the problem of perception and understanding of the scientific text – the inconsistency of the cognitive and psychological capabilities of the subject to the specifics of the object of study. One of the ways to resolve this contradiction, in our opinion, may be a strategy for adapting the method and means of transmitting information to the subject's speech system: changing the vision structure of the fragment of non-linguistic reality behind the text.

Thus, the choice of a strategy for overcoming communicative difficulties when perceiving a scientific text should be due to the cognitive-psychological capabilities of the recipient person, his speech and communicative experience. The adaptation of the sign system, information transfer code to the communication process can help motivate the learning process, update cognitive needs.

There was a need to train future specialists to write scientific texts of various levels with the entry of Kazakhstan into the world scientific and educational space, with the transition to three-level educational programs (undergraduate, master's degree, doctoral studies), an increase in the requirements for the level of publications – the publication of scientific articles in the list of Web of Science, Scopus. Some aspects of teaching scientific, academic discourse are considered in the works of G. A. Dubinina, N. V. Savchenko, O. L. Dobrynina, O. M. Demidova, A. M. Perlov (Dubinina, 2014: 42). It is necessary to consider the features and characteristics of scientific publications, works and texts, to highlight their genre, linguistic and stylistic features to better prepare students for scientific activity. The scientific style of the language functions in the field of science, technology and production. Linguistic features of the scientific style are: preliminary reflection of the statement, normalization and monological character of speech, strict selection of language means. The texts of the scientific style reflect the stages of scientific thought activity of the author, who, based on the facts, puts forward a hypothesis explaining a phenomenon, finds ways to test it, evidence, and understands the general system of scientific knowledge. The scientific text implies the author's desire to rationally submit information to the generalized addressee. The main features of scientific communication are: scientific topics, accurate definition of concepts,

the desire for generalization, abstraction, the logic and evidentiary nature of presentation, the objective nature of presentation, the saturation of factual information, and the conciseness of presentation. The scientific style has a number of common features, manifested regardless of the nature of the sciences themselves (natural, exact, humanities) and the genres of the statement (monograph, scientific article, report, textbook, etc.), which allows us to talk about the specifics of the style as a whole. It is characterized by a logical sequence of presentation, an ordered system of connections between parts of the statement, the desire of the authors for accuracy, compression, unambiguity of the expression while maintaining the saturation of the content. The main function of the scientific style is not only the transmission of logical information, but also the proof of its truth, novelty and value. The secondary function of the scientific style is the activation of the logical thinking of the reader (listener). The scientific style is divided into three main varieties: scientific, scientific and educational, science popular and many varieties serving the field of science. Scientific communication is implemented mainly in written speech. About 20 genres of scientific text stand out in writing, the most popular in the learning process of which are a conception, abstract, theses, article, annotation, review. Written scientific documents include unpublished documents: dissertations, deposited manuscripts, reports on research and development, scientific translations, review and analytical materials. However, with the development of mass communication media, with the growing importance of science in modern society, an increase in the number of various types of scientific contacts, such as conferences, symposia, scientific seminars, the role of oral scientific speech increases. The oral form is secondary, since it is based on a pre-written text. In oral scientific speech, the main genres are a report, a speech in a discussion, etc.

Engaging with the scientific literature is a key skill for researchers and students on scientific degree programs; it has been estimated that scientists spend 23% of total work time reading (Hubbard, 2017). The number of papers an individual scientist reads annually increased from 188 to 280 between 1993 and 2005, while total time spent only increased marginally. Scientific writing is characterized by highly specialist vocabulary, concise and precise use of language, often accompanied by complex grammatical structures. Making sense of scientific papers can be therefore cognitively challenging, particularly for readers who may be unfamiliar with the terminology of the field. This challenge

is faced by undergraduate students and early career scientists, but may also be encountered by experienced researchers exploring the literature in another discipline. We currently have a relatively poor understanding of how skills relating to the processing of scientific text develop through academic careers, the potential barriers to engaging with technical documentation and subsequent impact on the development of disciplinary or interdisciplinary research activities.

Results and discussion

The article reveals the main problems for understanding the scientific text: the complexity of the encoded meaning, the complexity of the language code and the limited capabilities of the subject of speech. According to the researchers, the named reasons reflect the essence of the problem of perception and understanding of a scientific text: the discrepancy between the cognitive and psychological capabilities of the subject and the specificity of the object of study. In the article, we draw attention to the fact that the formation of the text content in the process of perception of the image is possible due to the actualization of personal meanings, reflecting the practical, mental and emotional experience of the subject. We come to the conclusion that the choice of a strategy for overcoming communication difficulties in the perception of a scientific text should be determined by the cognitive and psychological capabilities of the recipient person, his or her speech and communicative experience.

It is promising to appeal to the psycholinguistic analysis of the scientific text and its perception by bilingual respondents. In Kazakhstan, in the

context of the transition to multilingual education, both the format of training and the requirements for undergraduates, doctoral students, young scientists have changed. It is assumed that the novice researcher speaks English at the proper level and can read, understand and interpret the scientific text. However, in reality, the problem is much more serious, since the process of perceiving a scientific text itself is a complex psycholinguistic problem associated with many linguistic, cognitive factors.

Conclusion. We are interested in the problems of understanding and perception of scientific texts by bilingual readers, undergraduates. Our goal is to define psycholinguistic processes and their interpretation during the reading of the scientific text by bilinguals in the modern academic space in Kazakhstan. After all, it is at the master's degree that a serious process begins to write various scientific texts such as articles, theses, dissertations and reports at conferences. In the future, if the student wishes, this process continues in doctoral studies. Therefore, it is important at the initial stage, at the master's degree, to identify problems of understanding the scientific text, thereby building a universal model of perception of the scientific text. We also plan to develop a technique for quickly understanding the scientific text, thereby facilitating the process of reading and collecting material for student's own scientific texts. We believe that this is a very urgent problem, as mentioned above, the requirements for young scientists and their publications have changed in Kazakhstan. Each novice scientist is faced with the problem of writing and further publishing his work. Therefore, it is important for us to identify the causes of these difficulties and propose our own models and techniques to solve them.

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