

## **DIFFICULT FOREIGN SCIENCE TEXTS AS THE CHALLENGE FOR UKRAINIAN STUDENTS**

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The article deals with the problem of the work with science texts in foreign languages by technical departments' students that include reading, perception and comprehension. The author considers this work very important for the future engineers, their self-perfection and promotion. These are some definitions of the reading and an essential component of successful reading comprehension. Reading of foreign science texts is represented as a challenge because of many difficulties that students encounter. Two types of indicators – subjective and objective divided in two groups – that quantify the difficulty of tasks proposed by G. Ball are described. Some subjective and objective psychological and other difficulties in foreign science literature are suggested. The importance of such psychological characteristics of students as operational, cognitive, motivational and personal is emphasized. Having analyzed a number of relevant psychological and pedagogical investigation findings the author addresses the problem in question from the perspective of students' psychological features (motivation, learning style, intelligence type, memory, attention and also reading habits, self-organization, etc.). Taking into account of these characteristics makes lessons of English for specific purposes or French for specific purposes and the work with foreign science texts more effective. The article offers some practical recommendations about the design of practical classes based on the psychological needs of each student. It gives suggestions for "Foreign languages for special purposes" syllabus that would make lessons more effective by taking into account psychological features of each student, their motivation, cognitive features and so on.

*Keywords:* foreign science texts; reading; English for specific purposes; individual psychological features; cognitive difficulties.

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## **СКЛАДНІ ІНШОМОВНІ НАУКОВІ ТЕКСТИ ЯК ВИКЛИК УКРАЇНСЬКИМ СТУДЕНТАМ**

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У статті розглядається проблема роботи з науковими текстами іноземними мовами студентами технічних факультетів, яка включає читання, сприйняття і розуміння. Автор вважає цю роботу дуже важливою для студентів-інженерів, їх самовдосконалення та майбутньої роботи за спеціальністю. Наведено деякі визначення читання і важливий компонент успішного розуміння прочитаного. Читання іншомовних наукових текстів представляється складним завданням через ряд утруднень, з якими стикаються студенти. Описано два типи показника – суб'єктивний і об'єктивний – які розділені на дві групи, та визначають ступінь складності задач, запропонованих Г. Баллом. Представлені деякі суб'єктивні і об'єктивні психологічні та інші утруднення, які виникають під час читання іншомовної наукової літератури. Підкреслюється важливість таких психологічних компонентів, як операційний, когнітивний, мотиваційний та особистісний. Проаналізувавши ряд психологічних і педагогічних досліджень, автор розглядає дану проблему з точки зору психологічних особливостей студентів (мотивація, стиль навчання, тип інтелекту, пам'ять, увага, а також читацькі звички, рівень самоорганізації і т. д.). Урахування цих характеристик, робить заняття з іноземної мови для технічних спеціальностей та роботу з іншомовними науковими текстами більш ефективною. У статті

пропонуються рекомендації з розробки практичних занять, побудованих на психологічних особливостях кожного студента. Даюся деякі практичні рекомендації щодо створення навчальної програми «Іноземна мова для технічних спеціальностей», яка дозволила б зробити заняття більш ефективними з урахуванням психологічних особливостей кожного студента, його мотивації, когнітивних особливостей і т.д.

*Ключові слова:* іншомовні наукові тексти; читання; англійська мова для технічних спеціальностей; індивідуальні психологічні особливості; когнітивні утруднення.

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## INTRODUCTION

Reading of science literature plays an important role in education of technical departments' students. However, foreign science text comprehension is relatively neglected area in psychological research. In fact while reading of science texts in foreign languages encounter many different difficulties caused not only by grammar or lexical features of such literature. The reasons of these difficulties are individual psychological features of students (memory, perception, attention, etc.), their motivation, diligence, self-organization and so on. While teaching English for specific purposes (ESP) or French for specific purposes (FSP) at the university it is important to find the ways to increase students' motivation so that they understood why they need to read foreign science texts and how they could use their reading skills at work.

The analysis of Ukrainian and Russian psychological literature shows that most of works are devoted to the problem of reading comprehension [2-7, 9, 10, 11]. However, it is important to understand how other psychological features such as motivation, cognitive and personal psychological features influence the work with foreign science texts. We mean not only perception and comprehension but all habits and stages of this work including choice of the texts, attitude to the foreign science literature, methods of work with difficult texts and so on.

Moreover, all of difficulties that students encounter while reading of science texts explain why this work is difficult and why it has become difficult to entice students to major in science. The process of learning and reading science is a challenge. Reading foreign science text is a struggle that takes effort and concentration.

## THE PROBLEM OF FOREIGN SCIENCE TEXTS READING

According to Z. Klychnikova [9], the reading is the process of perception and active processing of information graphically coded by language system; it is a complex analytic and synthetic activity which consists of text's perception and comprehension. Thus the most perfect (mature) reading is characterized by the confluence of these two processes and by the attention concentration on the semantic sense. The mature reading means the forming of abilities to read an unknown authentic text on one's own, rather quickly, with the correct comprehension and for many purposes.

Till recently some psychologists and methodologists considered as appropriate to translate the foreign text into the mother tongue for its comprehension. Now teachers follow the principle of text comprehension without translation. Perception and comprehension appear the basic processes of subjective reflection of the objective world.

The proof of the text perception is its comprehension, finding of the nature of objects and phenomena described in the science text, comprehension of relations, relationships and dependencies between them.

According to Goldman, Bisanz, Kintsch, van den Broek and others, during comprehension readers construct a memory representation of the text that critically depends on their interpretation in light of prior knowledge. The success of the comprehension process, therefore, is contingent on the integration of readers' prior knowledge with textual information [14].

It should be noted that science is a system of knowledge about nature, society and thought it reflected the facts are different theories and methodology that form the scientific content type within specified subject areas of science. They define the structure and language design of science texts.

G. Ball analyzes the problem of qualitative characteristics of the tasks, especially, the levels of tasks complexity. As the reading of science foreign texts is a task for every EFL student, we

consider as important the analysis of this work. He indicates that they use different indicators – subjective and objective to quantify the difficulty of tasks.

Subjective indicators can be divided into two groups: the indicators of the first group reflect on the opinions and experiences of subjects themselves, solving problem and so on, and the indicators of the second group reflect on the views of experts. Subjective indicators of both groups are used in particular to describe the difficulties of texts [1].

Objective indicators are also divided in two groups. The first group includes those that are characterized by the use of resources by the subject. It includes physiological indicators, the duration of the process of decisions discrete behavioral indicators characterizing resources expenditure.

G. Ball also supports the thesis that the understanding of rather complicated text becomes considerably easier and deeper, especially if they form comprehension techniques of the text, if in the process of reading they allocate a task situation and then formulate and solve the corresponding informative tasks [1].

An essential component of successful reading comprehension is the construction of a coherent memory representation of the text. To construct a coherent representation, the reader must interpret each element of the text and identify meaningful connections to other elements in the text and in semantic knowledge. The resulting representation consists of nodes, which capture the elements in or related to the text, and connections, which capture the semantic relations between text elements, together, these nodes and connections form a network. The more interconnected the representation, the more coherent it is. Indeed, extensive research in comprehension of narratives has shown that texts with a high density of connections are perceived to be more coherent than texts with a low density that individual text elements with many connections are recalled more frequently and more quickly than elements with few connections, that the former are deemed more important and included in summaries more frequently than the latter, and that connected text elements prime each other more strongly than they prime unrelated elements [14].

Therefore, the methods of overcoming of cognitive difficulties while working with foreign science texts should consider some features, as the terminology and the realities, acronyms and abbreviations, general scientific vocabulary, present tense, passive voice and so on.

So, during our study we found the most common types of difficulties that students meet while working with foreign science texts. Most students have their own wrong knowledge that contradicts scientific concepts and principles presented in the science literature. Every year scientific theories are more complicated; as a result, the students often develop a negative attitude towards foreign science texts, which negatively affect their educational strategies.

Therefore, while teaching students to work with a foreign science texts teacher should also pay attention to the objective difficulties, as well as to the individual difficulties.

An effective method of overcoming the cognitive difficulties met by students during the reading of foreign science texts should include the individual psychological features of students in order to maximize the individualization of learning. One type of individualization takes into account memory, thinking, perception of students, cognitive strategies they use in learning. To get a sense of individual psychological features of students they use special tests.

Reading of science texts in foreign language is an important part of future specialists training, but the analysis of the current state of foreign language teaching literature indicates the absence of effective methods based on personal psychological characteristics of students that would improve foreign science texts comprehension.

Reading is a complex analytic-synthetic process that involves perception, active processing of printed information for further oral or written reproducing.

Finding of logical connections in a foreign language science text requires extremely intense mental work that is associated with specific compositional and logical complexity and the complexity of the concepts and terminology of these types of text.

Objective factors affecting adequate understanding of foreign science texts are: logical complexity of the composition; complexity of concepts and terminology; the presentation of information; multiple meaning of foreign terms and words; information saturation of the text; lack of interesting figurative information; no additional information in the text (links, comments, conclusions); lack of illustrations, diagrams in the text;

Subjective factors should be considered: lack of motivation of reading; previous reading experience, professional knowledge; technique of reading and finding of relevant information in the text; lack of clear purposes of reading; ability to combine in mind already translated text

blocks into a single unit; lack of necessary skills to work with text; open access to foreign science texts; lack of time for reading; emotional state during the reading; lack of knowledge about the features of science text.

The syllabus that would improve reading skills of foreign science texts should:

- take account of the individual psychological features of students: their learning style, memory and perception features; the type of intelligence, etc;
- be based on the principles of accessibility, visibility, activity, regularity and consistency;
- provide a coherent transition from a direct understanding of the meaning of the text to discussion of the problem;
- take into account the orientation of students to individual or group work;
- cover both oral and writing speech of students;
- include mnemonic methods and visual material;
- take into account the cognitive difficulties met by students during reading of foreign science texts;
- include tasks that would help the students to develop all kinds of memory, that students would read, write and repeat the material during each lesson.

Our theoretical model consists of the factors of successful work with foreign science texts:

- a. Defined pedagogical factors: characteristics of the process of learning to work with foreign language science texts;
- b. Psychological factors: features of work with texts, individual psychological features of students and professional attitudes (interests, motivation, etc.);
- c. Profession competence: professional knowledge and skills of students (deep knowledge of the specialty, the knowledge of professional vocabulary, etc.) and the proficiency in foreign and native languages, knowledge of grammatical structures, vocabulary sufficient for reading of medium complexity, etc.

#### CONCLUSIONS AND PROSPECTS OF SUBSEQUENT RESEARCH

Students of technical departments should realize the importance of learning of foreign languages and a responsible attitude to reading of foreign science texts. And so, in order to intensify the language learning, teachers should pay special attention to the work with foreign science texts, because due to this work, students get an invaluable experience in search and analysis of information necessary for their successful learning and professional improvement.

It needs to be emphasized this theoretical research is not an end in itself. Challenges remain in taking what we've learned from theoretic studies to build more complete model of increasing of effectiveness of foreign science texts reading and create the syllabus with psychological trainings and exercises.

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