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Developing Students' Functional Literacy in Mother Tongue Lessons Based on Texts Related to Natural Sciences

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Abstract: This article examines the methodological possibilities of developing students' functional literacy in mother tongue lessons through the use of texts related to natural sciences. Functional literacy is interpreted as the ability of learners to understand, analyze, interpret and apply information in real-life, academic and social contexts. In modern education, language learning can no longer be limited to the memorization of grammatical rules or reproduction of ready-made texts. It should support students' ability to work with different types of information, including scientific, ecological, biological, geographical and technological content. The integration of natural science texts into mother tongue lessons creates favorable conditions for developing reading comprehension, scientific vocabulary, argumentation, critical thinking, written communication and problem-solving skills. The article is based on theoretical analysis of pedagogical, linguistic and methodological literature, as well as the principles of interdisciplinary learning and competency-based education. The results show that natural science texts enrich the content of mother tongue education, strengthen students' cognitive activity and prepare them to use language as a practical tool for learning, communication and decision-making. The article proposes methodological approaches for selecting, analyzing and using natural science texts in mother tongue lessons.

Keywords: Functional literacy, mother tongue education, natural sciences, interdisciplinary integration, reading comprehension, scientific text, language competence, critical thinking, communicative competence.

Introduction: The development of functional literacy has become one of the central aims of contemporary school education. In the conditions of rapid scientific, technological and social change, students are expected not only to know language norms, but also to use language effectively in real situations. Functional literacy includes the ability to read and understand various types of texts, extract necessary information, compare facts, make conclusions, express opinions, solve problems and apply acquired knowledge in practical contexts. Therefore, mother tongue education should be directed not only toward grammatical correctness, but also toward meaningful communication, analytical reading and independent thinking.

Mother tongue lessons have a special role in developing students' intellectual and communicative potential because language is the main instrument through which knowledge from all subjects is acquired and expressed. A student who cannot understand the content of a scientific text, explain a phenomenon in written form or justify an opinion with evidence faces difficulties not only in language lessons, but also in biology, geography, physics, chemistry and other subjects. For this reason, the integration of mother tongue education with natural sciences is an important methodological direction.

Texts related to natural sciences have significant didactic potential. They contain factual information, cause-and-effect relations, definitions, classifications, descriptions of processes, explanations of phenomena and evidence-based arguments. Working with such

texts helps students master scientific style, develop terminological vocabulary, understand logical connections and express ideas accurately. At the same time, natural science texts are closely connected with everyday life. Texts about water, air, plants, animals, climate, health, energy, ecology or technological progress encourage students to reflect on real problems and use language for practical purposes.

The relevance of this topic is also connected with international assessment systems such as PISA, which evaluate students' ability to apply reading, mathematical and scientific knowledge in real-life situations. In such assessments, students are often required to read informational texts, interpret diagrams, distinguish facts from opinions, identify arguments and make reasoned decisions. This means that the development of functional literacy requires the integration of reading literacy and scientific literacy. Mother tongue lessons based on natural science texts can serve as an effective pedagogical environment for this integration.

The purpose of this article is to analyze the methodological foundations of developing students' functional literacy in mother tongue lessons through texts related to natural sciences. The article seeks to clarify the pedagogical value of interdisciplinary text work, identify effective teaching methods and describe expected learning outcomes.

The research is theoretical and methodological in nature. It is based on the analysis of scientific literature on functional literacy, disciplinary literacy, reading comprehension, scientific literacy and interdisciplinary teaching. The study also relies on competency-based education principles, according to which learning outcomes should be connected with students' ability to use knowledge and skills in practical contexts.

The methodological basis of the article includes the idea that literacy is not limited to decoding written signs. It involves understanding, interpretation, evaluation and application of information. In this sense, the mother tongue lesson becomes a space where students learn to process different types of texts and transform information into oral and written communication. Natural science texts were considered as didactic material that allows the teacher to combine linguistic analysis with cognitive, ecological and scientific content.

The study used methods of pedagogical analysis, comparative interpretation, generalization and modeling. Pedagogical analysis made it possible to determine the educational potential of natural science texts in mother tongue lessons. Comparative interpretation was used to identify connections between language competence and science-related literacy skills. Generalization helped define the main methodological conditions for effective integration. Modeling was applied to describe a possible lesson structure based on pre-reading, while-reading and post-reading activities.

The article does not present experimental statistical data. Instead, it develops a methodological framework that can be used by teachers, researchers and curriculum designers. This approach is appropriate because the integration of natural science texts into mother tongue lessons first requires theoretical clarification of its aims, content, methods and expected results.

The analysis shows that the use of natural science texts in mother tongue lessons can develop functional literacy in several interconnected directions. First, such texts improve reading comprehension because they require students to identify the main idea, distinguish key and secondary information, understand cause-and-effect relations and interpret scientific explanations. Unlike purely literary texts, natural science texts often have a clear logical structure, include definitions and rely on factual accuracy. This helps students develop analytical reading strategies.

Second, natural science texts enrich students' vocabulary. In mother tongue lessons, vocabulary work is often connected with synonyms, antonyms, phraseological units or stylistic features. However, modern functional literacy also requires knowledge of scientific and academic vocabulary. Words such as "process", "phenomenon", "environment", "organism", "substance", "energy", "pollution", "observation", "evidence" and "conclusion" are not only terms of natural sciences, but also important elements of academic communication. When students learn to understand and use such words in context, their speech becomes more precise and meaningful.

Third, natural science texts develop students' ability to

construct coherent oral and written statements. Scientific and informational texts usually present facts in a logical sequence. Students can learn how to describe an object, explain a process, compare phenomena, classify concepts and justify conclusions. For example, after reading a text about the water cycle, students may write an explanatory paragraph using sequence markers such as “first”, “then”, “as a result” and “therefore”. After reading a text about environmental pollution, they may prepare an argumentative statement explaining why waste reduction is important. In this way, grammar and vocabulary are studied not in isolation, but in meaningful communication.

Fourth, the integration of natural science texts strengthens critical thinking. Functional literacy requires students to evaluate information, identify reliable evidence and make reasoned judgments. Natural science topics naturally create opportunities for such tasks. Students can compare two texts about climate change, analyze whether a statement is fact or opinion, determine whether a conclusion is supported by evidence or discuss possible solutions to an ecological problem. These activities teach students to read actively and responsibly.

Fifth, interdisciplinary text work increases students’ motivation. Many students perceive grammar exercises as abstract and disconnected from real life. Natural science texts, on the other hand, deal with visible and understandable phenomena. Texts about animals, human health, space, weather, plants or technology can awaken curiosity and encourage students to participate in discussion. When learners see that mother tongue lessons help them understand the world around them, their attitude toward language learning becomes more positive.

The analysis also shows that the effectiveness of this approach depends on the careful selection of texts. Texts should correspond to students’ age, language level and cognitive development. They should not be overloaded with difficult terminology. At the same time, they should contain enough scientific content to stimulate thinking. The best texts are those that combine informational clarity, linguistic richness and practical relevance. Short scientific-popular texts, adapted textbook fragments, ecological reports, descriptions of experiments, biographies of scientists and problem-based texts can be used effectively.

A productive lesson model may include three stages. At the pre-reading stage, students activate prior knowledge, discuss key words and predict the content of the text. At the while-reading stage, they identify the main idea, underline terms, complete tables, answer comprehension questions and analyze sentence structures. At the post-reading stage, they summarize the text, express opinions, write a short explanation or connect the information with real-life situations. Such a structure allows the teacher to combine reading, vocabulary, grammar, speaking and writing.

The integration of mother tongue education with natural sciences should not be understood as replacing language content with science content. Its main purpose is to teach language through meaningful and socially relevant material. In this process, natural science texts become a means of developing linguistic, cognitive and communicative competencies. The teacher remains focused on language learning outcomes, but these outcomes are achieved through interdisciplinary content.

One of the important methodological issues is the balance between scientific accuracy and linguistic accessibility. If the text is too difficult, students may lose interest and fail to understand the content. If the text is too simple, it may not develop academic vocabulary or analytical thinking. Therefore, the teacher should adapt texts when necessary. Adaptation may include shortening long sentences, explaining terms, adding visual support or dividing the text into logical parts. However, adaptation should not remove the scientific essence of the text.

Another important issue is the role of questions and tasks. Traditional comprehension questions often check only whether students remember facts from the text. Functional literacy requires deeper tasks. Students should be asked to explain why a phenomenon occurs, how one fact is connected with another, what conclusion can be drawn from the text and how the information can be used in life. For example, after reading a text about air pollution, students may be asked to identify causes, consequences and possible solutions. Such tasks develop both language competence and problem-solving ability.

Natural science texts also create opportunities for grammar instruction. Grammar can be taught functionally, that is, in connection with meaning and communication. For instance, passive constructions may be studied through descriptions of scientific processes, compound sentences through cause-and-effect relations, adjectives through descriptions of natural objects and modal verbs through ecological recommendations. This approach helps students understand that grammar is not a set of isolated rules, but a tool for expressing ideas accurately.

The development of written speech is another significant advantage of this integration. Students can write summaries, explanations, descriptions, reports, instructions, observations and argumentative paragraphs based on natural science texts. Such writing tasks prepare learners for academic communication. They also teach students to organize information logically, use evidence and avoid unsupported claims. In modern education, this ability is especially important because students are constantly exposed to large amounts of information and must learn to transform it into clear and responsible communication.

The integration of natural science texts into mother tongue lessons also supports environmental education. Texts about water conservation, biodiversity, climate, waste management and healthy lifestyle help students develop ecological awareness. However, the teacher should avoid turning the language lesson into moral preaching. Ecological content should be connected with language tasks: reading, discussing, comparing, explaining, persuading and writing. In this case, students develop both functional literacy and responsible attitudes toward the environment.

From the perspective of teacher practice, this approach requires methodological preparation. Teachers need to know how to select suitable texts, design interdisciplinary tasks and assess students' functional literacy. Assessment should include not only correct answers, but also the quality of reasoning, clarity of expression, use of vocabulary, ability to summarize and application of information. Rubrics can be useful because they make assessment criteria transparent. For example, a student's written response may be assessed according to content accuracy, logical structure, use of terms, grammatical correctness and practical conclusion.

The approach is also compatible with collaborative learning. Students may work in pairs or groups to analyze a text, prepare questions, create a concept map or present a solution to a problem. Collaborative tasks encourage communication and allow students to learn from one another. At the same time, the teacher should ensure that every student participates actively and that group work leads to a concrete language product, such as an oral explanation, written summary or mini-presentation.

Digital resources can further enrich this process. Short educational videos, infographics, interactive diagrams and online articles can be used together with written texts. However, digital materials should not replace reading; they should support comprehension and discussion. Students may compare information from a written text and an infographic, describe a diagram in words or write a short conclusion after watching a science-related video. Such multimodal activities correspond to the realities of modern communication, where information is often presented through a combination of text, image and data.

The results of the theoretical analysis confirm that mother tongue lessons based on natural science texts can contribute to the development of a learner who reads consciously, thinks critically, communicates clearly and applies knowledge in real situations. This is the essence of functional literacy. The approach is especially valuable because it connects language learning with life, science and social responsibility.

Developing students' functional literacy in mother tongue lessons through texts related to natural sciences is a relevant and methodologically grounded direction of modern education. It allows teachers to enrich language instruction with meaningful content and helps students understand that language is a practical instrument for learning, communication and problem solving. Natural science texts develop reading comprehension, academic vocabulary, logical thinking, written speech, argumentation and critical evaluation of information.

The effectiveness of this approach depends on several pedagogical conditions. Texts should be age-appropriate, scientifically accurate and linguistically accessible. Tasks should go beyond simple reproduction of facts and require analysis,

interpretation, explanation and application. Grammar and vocabulary should be taught in connection with the communicative function of the text. Assessment should consider not only linguistic correctness, but also the student's ability to understand information, reason logically and express conclusions clearly.

Mother tongue education integrated with natural sciences prepares students for real-life communication and lifelong learning. It supports the formation of a competent, thoughtful and socially responsible learner who can understand scientific information, participate in discussions and make informed decisions. Therefore, the systematic use of natural science texts in mother tongue lessons should be considered an important methodological resource for developing functional literacy in school education.

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