

# Text Complexity Dynamics in Russian Textbooks on “Environmental Studies”. The Case of the 2<sup>nd</sup> Grade<sup>1</sup>

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## Abstract

To comprehend an academic text is one of the main tasks for pupils of both elementary and secondary schools. Developing of reading skills is viewed as one of the most important questions for teachers, scientists and is a cause for concern to schoolchildren's parents. The aim of the present research is to investigate the dynamics of text complexity in the textbook “Environmental studies” (written by A. Pleshakov, 2012) for pupils of the second grade of comprehensive schools. The textbook consists of two parts, with twelve texts in Part I and sixteen texts in Part II. The corpus compiled for the research comprises twenty-eight texts from the stated textbook. The academic year of second class pupils is divided into four quarters. Consequently, the first part of the textbook, that is 12 texts, is studied in the first two quarters – from September to December. The second part – 16 texts - in the third and fourth quarters: from January till May. The texts differ in syntactic structure and length. Syntactic simplicity was evaluated on the basis of the mean number of words in the sentence, number of syntactic structures, number of words before the predicate, and the number of simple and composite sentences. Contrastive analysis of texts in both parts did not reveal obvious dynamics in complexity. The texts in both parts tend to have similar quantity of simple and composite sentences. However, the texts from the first part of the textbook are shorter, but sentences are longer and they are more elaborated than sentences of the second part. Syntactic simplicity of texts varies across the textbook.

**Keywords:** Textbook; Text Complexity; Syntactic Structure; Sentence.

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## 1. Introduction

Catherine Snow defines a list of the following five parameters which differ texts: 1) discourse genre, such as narration, description, exposition, and persuasion; 2) discourse structure, including rhetorical composition and coherence; 3) media forms, such as textbooks, multimedia, advertisements, hypertext, and the Internet; 4) sentence difficulty, including vocabulary, syntax, and the propositional text base (the explicit meaning of the text's content drawn from propositions in the text, i.e., statements or idea units, but without more-subtle details about verb tense and deictic references [here, there, now, then, this, that]); 5) content, including different types of mental models, cultures, and socioeconomic strata; age-appropriate selection of subject matter; and the practices that are prominent in the culture; 6) texts with varying degrees of engagement for particular classes of readers (Snow, 2002; Parvizian, et al., (2015).

V. Ivanov (5) points out three characteristics for text complexity prediction: "First, average sentence length is the most important feature for text complexity prediction. Second, average number of coordinating chains, average number of subtrees, as well as frequency and lexical features that can improve prediction. Third, surprisingly, average syllables per word may not be a very important feature (in presence of other features), even though it correlates with target variable" (Ivanov et al., 2018).

McNamara writes that syntactic simplicity is "the degree to which the sentences in the text contain fewer words and use simpler, familiar syntactic structures that are less challenging to process. At the opposite end of the continuum are texts that contain sentences with more words and that use complex, unfamiliar syntactic structures" (McNamara et al., 2014; Marbán & Mulenga, 2019).

Readability has been actively studied for over five decades (Dzmitryeva, 2017; Galiakhmetova, 2016; Gatiyatullina et al., 2018; Graesser et al., 2004; Klare, 1963; Krioni et al., 2008; Obobroneva, 2006; Shpakovskiy, 2007; Solnyshkina et al., 2017; Solovyev et al., 2018; Solnyshkina et al., 2018; Solnyshkina & Kiselnikov, 2015; Solovyev et al., 2018). While defining readability George Klare (1963) focuses on the writing style and defines it as "the ease of understanding or comprehension due to the style of writing." William DuBay (2004) also singles out an attribute of clarity: "Readability is what makes some texts easier to read than others". Snow (2002) considers that a text itself is though important though insufficient to determine reading comprehension. The researcher defines reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. Comprehension entails three elements: 1) The reader who is doing comprehending; 2) The text that is to be comprehended; 3) The activity in which comprehension is a part (Snow, 2002).

Readability and syntactic simplicity are interdependent categories. Syntactic simplicity is a metric determined by three variables – number of grammatical

structures, the average number of words in a sentence and the number of words preceding the predicate in a sentence. The number of sentences with several grammatical constructions in a text and sentence length are directly proportional to its complexity. The third variable means: the farther the predicate from the sentence beginning the more complicated a text is (Graesser et al., 2004; McNamara et al., 2014). Let us illustrate the above by the sentences in which all three variables vary:

- 1) We played football all afternoon.
- 2) Only the girl wasn't me – the profile said her name was Lydia and she was from Sussex, which is miles away from where I live.

The first sentence is very simple. It has one syntactic structure, the sentence is only five words long, with one word preceding the predicate - played. The second sentence is complicated: there are six grammatical structures in the sentence, it is twenty-five words long.

## **2. Methods and materials**

The research was conducted on the corpus of twenty-eight texts. All the texts vary in length and syntactic structures. For instance, text N12 is the longest and consists of forty-four sentences, whereas texts N7 and N8 have twenty-one sentences each. The shortest text in the textbook is text N1, it has eighteen sentences. For the detailed information see Table 1 below.

The discipline “Environmental studies” implies coverage of various topics. So the themes of the texts are different: Text 1 focuses on the population of Russia, Text 2 is about Universe and Solar System; Text 11 – gives an account of ethnoscience; Texts 13 and 14 focus on seasons; Texts 19-25 tell about animate nature.

The research was conducted in two stages. In the first stage of our research we selected all the texts from both parts of the textbook. In the second stage we conducted quantitative studies and computed the mean number of sentences in texts, including an average number of simple and composite ones, the average number of words per text, syntactic structures per sentence, and the average number of words preceding the predicate.

A simple sentence is referred to as “a sentence consisting of one independent clause only. It usually has a subject and verb, and often an object or complement and one or more adjuncts” (Macmillan Dictionary). “A composite sentence consists of two or more simple sentences joined together. ... The relationship between the clauses may be that of coordination (compound sentence) and subordination (complex sentence)” (Krylova & Gordon, 1999).

### 3. Results and discussion

Table 1. *The Average Metrics of Texts in Both Parts of the Textbook*

Part of the textbook	Quarter	Number of texts	The average number of sentences per text	Words per text	Words per sentence	A number of syntactic structures per sentences	A number of words before the predicate	Sentence structure	
								Simpl e	Composi te
1	1,2	12	29.8	276.4	9.3	1.3	2.8	21.5	8.2
2	3,4	16	32.3	284.9	8.9	1.4	2.4	25	8.1

#### **Part I**

The quantitative analysis showed the following: the average number of sentences per text in the first part of the textbook is 29.8. The average number of words per text is 276.4, per sentence is 9.3, for example, *A vot v musul`manskom kalendare data novogo goda peredvigajetsya v techeniye 30 let po vsem sezonam, tak zhe kak I drugiye musul`manskiye prazdniki.* / New Years' Day shifts for 30 years through all seasons in Muslim calendar, as well as other Muslim holidays (Text 9). *My – zhiteli vselennoi!* / We are inhabitants of the Universe (Text 2). Generally, a number of words in a sentence ranges from 14 to 16. But short sentences with three or four words occur very often. The texts from Part I sporadically consist of strongly elaborated sentences with number of words up to 24, for example: *My otdayem dan` uvazheniya i blagodarnosti vsem, kto stoyal, stoit i budet stoyat` s oruzhiyem v rukah na zaschite chesti I dostoinstva nashei Rodiny.* / We respect and thank all those who were up in arms to protect the honor and dignity of our homeland (Text 10). The former sentence numbers 22 words.

As for syntactic structures in the first part of the textbook, they are slightly easier than those of the second term and equal to 1.3. The mean number of words preceding the predicate and number of composite sentences exceed the compared characteristic of the second part of the textbook and equals 2.8 words and 8.2 sentences. The last text in Part I (Text 12) is the longest (it consists of 44 sentences), but one of the simplest in terms of syntax. It contains 79.5% of simple sentences whereas Text 3 and Text 4 comprise no more than 55.6% and 63.6% of simple sentences. The number of syntactic structures per sentence in Text 12 equals 1.25. This indicator does not go beyond the average characteristic of all the texts. The average number of words before the predicate in this text is 1.9. This text is characterized by polar characteristics: there are 7 sentences in this text in which the predicate is the first word of the sentence. But there is also one sentence where the

predicate is on the 11<sup>th</sup> place. E.g.: *Tol'ko na nei, edinstvennoi iz vsekh planet, obraschajutsya Vokrug solntza, est` zhizn`.* / Life exists only on the only planet, moving round the Earth (Text 12).

Simple sentences often contain participial constructions, for example, *Zvezdy – eto ogromnye, raskalennye nebesnye tela, izluchayuschie svet.* / Stars are huge red-hot celestial bodies radiating light (Text 2). Sometimes participial constructions precede the predicate, detach the principal parts of the sentence and increase the number of words preceding the predicate, for example: *Vse izmeneniya, proiskhodyaschie v prirode, nazyvayutsya yavleniyami prirody (ili prirodnyimi yavleniyami).* / All the changes taking place in nature, are called natural phenomena (Text 7).

Part I did not reveal dynamics in complexity: only the first three texts demonstrate a slight increase in text complexity. Texts vary in length (from 18 to 44 words), number of syntactic structures (from 1.06 to 1.5) and number of words before the predicate (from 2.7 to 3.2). The ratio of simple and composite sentences is different throughout Part I (from 55.6% to 94.4%).

## **Part II.**

The texts in Part II of the textbook are longer than those in Part I. As we can see from Table 1, the average length of the texts is 32.3 sentences. For example: *A v blagodarnost` vode-poilitse otpravlyali po reke yagody, tavy, krupu v pletennukh iz prut`ev lodochkakh. Lyudi esche v drevnosti voskhischalis zvezdnym nebom i izuchali ego.* / To express gratitude to water one sent berries, grass, cereals in woven boats down the river (Text 15).

Number of simple sentences is higher, the average number is 25, and they are predominantly easier. The average number of words is 8.9 with the number of words before the predicate being 2.4. But there are sentences with 25 words. For example: *Nakanune zimy v bolshykh gorodakh mastera-santekhniki proveryayut, khorosho li rabotaet oborudovanie v zdaniyakh, tsely li trubyy dlya otopeniya, dlya goryachei i kholodnoi vody, dlya kanalizatsii.* / Before winter plumbing specialists check equipment in buildings, pipes for heating, for hot and cold water, for sewage (Text 26).

The number of composite sentences is also lower: in is on average 8.1 in each text. At the same time the texts of Part II of the textbook are much longer, the mean number of sentences per each text is 32.3.

The longest text in Part II is Text 14, consisting of 49 sentences, eleven of which are composite, which make 22.5%. There are a lot exceedingly short sentences, such as: *Poetomu kholodaet.* / Therefore it is growing colder. *Eto inei.* / It is hoarfrost (Text 14).

Text 14 is characterized by a high number of sentences with homogeneous parts, for example: *Ego luchy padayut naklonno, skolzyat po zemle i menshe nagrevayut ee.* / Its rays fall slantwise, glide over earth and warm it less. *Osen`yu gustye tumany chasto stelyutsya nad rekoi, ozerom, prudom.* / In autumn tight fogs often float over river, lake, pond (Text 14).

Text 17 is the shortest, it consists of 22 sentences. Eight sentences of this text (36.4%) are composite – that is more than one third of the sentences are syntactically complicated, for example: *Esli k rasteniyu prikosneshsya, igolochki vop`yutsya v kozhu, oblomyatsya i edkaya zhidkost vyl`etsya.* / If one touches the plant, needles will stick into skin, break off and caustic liquid will flow out (Text 17). This composite sentence has three syntactic constructions and 13 words, twice exceeding the mean number of words per sentence.

This study showed that the texts in Part II are longer than texts in Part I. However, the sentences are shorter and simpler: the number of simple sentences is higher and those simple sentences are not elaborated in comparison with simple sentences from the first part of the textbook. On the contrary, the texts of the first part contain fewer sentences with one syntactic construction, but those simple sentences often contain participial constructions, with a higher number of words before the predicate. All this makes texts from Part I slightly more complicated. Calculation showed that there are on average 9.3 words per sentence in the first part and 8.9 words per sentence in the second part. But in both parts there are sentences exceeding 25 words. The number of words before the predicate is in the same proportion – 2.8 words for the first part and 2.4 words for the second part.

#### 4. Summary

The research showed that the texts from the first part of the textbook “Environmental studies” for the second grade are shorter, but sentences are longer and they are more elaborated – the number of words before the predicate is higher, simple sentences are complicated with participial constructions and homogeneous parts. The number of composite sentences in Part I is also slightly higher. But the texts in both parts tend to have similar number of simple and composite sentences. On average, the latter have two syntactic structures, and rarely – three. Simple sentences as well as each syntactic structure in composite sentences number two or three words preceding the predicate. But there are unique sentences with 10 or 11 words before the predicate.

#### 5. Conclusions

Both parts texts showed doubtful dynamics in complexity across the “Environmental studies” textbook. The first texts in both parts are the simplest and the shortest in the entire textbook. But within both parts texts complexity varies. In

whole quantitative analysis shows that texts from the first part are slightly more complicated than texts from the second part.

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