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Analysis of the Educational Form of Academic Style Based on School Physics Textbooks

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Abstract. The evolution of the variety of scientific style in educational literature is examined using the material of Russian school textbooks on physics of the 19th–21st centuries. The object of the study is the linguistic features of physics textbooks by Nikolay T. Shcheglov (1834), Constantine D. Kraevich (1880), and the author's team led by Alexander V. Peryshkin (1960) and Lev E. Gendenstein (2012). In the context of modern digital reality, the analysis expands to include texts generated by neural networks (ChatGPT, Gemini, Alice), which have become a new source of information for students. The relevance of the research is determined by the need to study the dynamics of functional styles under the influence of sociocultural and educational transformations. The aim is to determine the vector of change in the scientific style, based on Russian educational and academic literature from different eras. Within the framework of this study, style is understood as the principle and method of selecting linguistic material. The novelty lies in the comparative linguistic analysis of educational texts separated by historical periods, which allows identifying trends in the development of scientific style. The results of the research show a steady trend towards a decrease in terminological saturation, reduction of the volume of educational material and explanations of rules in modern texts of textbooks. It is also possible to note the penetration of features of publicistic, conversational and official styles in a modern textbook, which loses the key characteristics of the scientific styles, unlike physics textbooks of the XIX–XXI centuries. The analysis of the text of neural networks shows us a logical continuation of the trend: scientific-spontaneous style with high degree of simplification, metaphorically and further reduction in terminological density.

Key words: functionals styles of language, terminology, educational literature, school textbook, neural network, artificial intelligence

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Анализ учебной разновидности научного стиля на материале школьных учебников по физике

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Аннотация. Эволюция разновидности научного стиля в учебной литературе рассмотрена на материале российских школьных учебников по физике XIX–XXI вв. Объект исследования — языковые особенности учебников по физике Н.Т. Щеглова (1834), К.Д. Краевича (1880), авторского коллектива под руководством А.В. Пёрышкина (1960) и Л.Э. Генденштейна (2012). В контексте современной цифровой реальности анализ расширяется до рассмотрения текстов, генерируемых нейронными сетями (такими как ChatGPT, Gemini, «Алиса»), которые становятся новым источником информации для школьников. Актуальность исследования обусловлена необходимостью изучения функциональных стилей под влиянием социокультурных и учебно-педагогических трансформаций. Цель исследования — установить вектор изменения научного стиля, опираясь на российскую учебно-научную литературу различных эпох. В рамках данного исследования под стилем понимается принцип и метод выборки языкового материала. Новизна заключается в сравнительном лингвистическом анализе учебных текстов, разделенных историческими периодами, что позволяет выявить тенденции развития научного стиля. Результаты исследования демонстрируют устойчивую тенденцию к снижению терминологической насыщенности, сокращению объема учебного материала и объяснений правил в современных текстах учебных пособий. Также можно отметить проникновение черт публицистического, разговорного и официально-делового стилей в современный учебник, который, в отличие от учебников по физике XIX и XX вв., утрачивает ключевые характеристики научного стиля. Анализ текстов нейросетей показывает, что они являются логическим продолжением данной тенденции: их ответам свойственен гибридный научно-разговорный стиль с высокой степенью упрощения, метафоричности и дальнейшим снижением терминологической плотности.

Ключевые слова: функциональные стили языка, терминология, учебная литература, школьный учебник, нейронные сети, искусственный интеллект

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Introduction

The school physics textbook presents unique material for observing the transformation of the canonical structure of the scientific style in modern realities. Combining scientific precision with pedagogical accessibility is one of the primary tasks of school textbook. However, maintaining a balance between it is not a constant phenomenon [1. P. 42–45]. How was the language of science changed over the past century and a half century? Which features of the scientific style are being lost, and which are being acquired through the evolution of school educational program, language and society? This study proposes to examine the problem through the lens of historical linguistics.

The subject of research is the formal features of the scientific style, the degree of manifestation of objectivity, logicity, informativeness, factual accuracy, and the dynamics of terminological density in texts.

The aim is to determine the vector of change in the scientific style, based on Russian educational and academic literature from different eras. Within the framework of this study, *style* is understood as the principle and method of selecting linguistic material.

M.N. Kozhina defines a functional type of speech, or a functional variety of language, as a (1) «общественно осознанная речевая разновидность, обладающая специфическим характером (своей речевой системностью), сложившимся в результате реализации особых принципов отбора и сочетания языковых средств», это разновидность, соответствующая той или иной социально значимой сфере общения и деятельности, соотносительной с определенной формой сознания, — наука, искусство, право и т.д.» ‘socially recognized speech variety, possessing a specific character (its own speech system), formed as a result of the implementation of special principles for the selection and combination of linguistic means’¹. In Russian linguistics, the problem of functional language varieties has been considered in the research of M.M. Bakhtin [2. P. 237–280], V.V. Vinogradov [3; 4], V.G. Kostomarov [5. P. 16–32], O.B. Sirotinina², and others.

Modern scholarship identifies five functional styles: scientific (objectivity, logically, informativeness, and factual accuracy), official (imperativeness,

¹ Kozhina, M.N. (2006). Functional style (functional variety of language, functional type of speech). In: *Stilisticheskij entsiklopedicheskij slovar' russkogo yazyka* (pp. 581–583). Moscow: Flinta; Nauka. (In Russ.). P. 60–87.

² Sirotinina, O.B. (2006). Colloquial style. *Stilisticheskij entsiklopedicheskij slovar' russkogo yazyka* (pp. 319–321). Moscow: Flinta; Nauka. (In Russ.). P. 319–321.

precision, absence of emotionally charged lexicon), public (evaluative nature, emotionality, logically, exhortation), literary (imagery, emotionality, use of expressive means, and colloquial (emotionality, expressiveness, informality) [6; 7].

All functional styles exist in a state of unstable equilibrium. Features of any functional style can be found in a text belonging to any type. The relationship between functional styles in texts changes depending on shifts in public consciousness. Russian scholar has notably drawn attention on this, for instance, O.I. Valentinova in “The bureaucratization of society — the bureaucratization of language” [8. P. 63—65], and T.A. Milekhina in the conference report “Oral business speech: dynamics of renewal and development trends (Business meeting in 2012 and 2023)” [9. P. 139—140].

Practical significance lies in the fact that the conclusions of the research can be applied in the teaching of the Russian language, stylistics, and communication theory to demonstrate the evolution of the scientific style. The findings can also serve as methodological recommendations for authors of school physics textbooks, aimed at preserving a balance between traditional methods: accessibility of presentation and scientific rigor.

Methodology and Research Materials

The following methods were employed in the study: *a comparative method* to contrast the terminology and stylistic features of the textbook under examination; *linguistic* and *qualitative* analysis to identify stylistic peculiarities, analyze sentences, and investigate the use of conjunctions; *stylistic analysis* to determine the dominant functional styles in school physics textbooks from different historical periods; *contrastive analysis* to examine the evolution of the terminological apparatus.

The research material comprised school physics textbook: (1) N.T. Shcheglov “Foundational principles of physics” (the first edition — 1834) — publishing during the reign of Nicholas I; (2) K.D. Kraevich “Physics textbook: a course for secondary educational institutions” (the seventh edition — 1880) — published during the reign of Alexander II; (3) A.V. Peryshkin, E.Y. Minchenkov, V.V. Krauklis “Physics: textbook for the 6th grade of secondary school” (the second edition from 1960) — published in the USSR; (4) L.E. Gendenstein, A.B. Kaydalov “Physics: textbook for the 7th grade in two parts” (the third edition — 2012) — published in modern Russia.

Additionally, a comparison with texts generated in a scientific style by popular neural networks, or large language models, is used: ChatGPT-4.5 (2025)³, Gemini 1.5 Pro (‘Google’) (2025),⁴ YandexGPT-5.1 Pro (‘Yandex’) (2025)⁵.

³ ChatGPT-4.5. URL: <https://openai.com/index/introducing-gpt-4-5/> (accessed: 10.06.2025).

⁴ Gemini 1.5 Pro. URL: <https://gemini.google.com/?hl=ru> (accessed: 17.09.2025).

⁵ YandexGPT-5.1 Pro. URL: <https://ya.ru/ai/gpt?ysclid=mhnayd05to265630578> (accessed: 15.09.2025).

Discussion and Results of the Study

On the Target Audience of the Selected Textbooks

These educational texts were intended for middle and high school students. In the 19th century, children were admitted to educational institutions such as district schools, also known as the schools of the country (*uezdnye uchilishcha*), parish schools (*prihodskie uchilishcha*), and gymnasiums at the age of 10–11 years old. However, according to the «Charter for Gymnasiums, District and Parish Schools» published in 1828, physics was taught in the parish schools only. The objectives of gymnasium education were following: «to prepare students for university studies and to provide them with the means for a proper upbringing» (Figure 1).

§ 143. Курсъ ученія въ Губернскихъ Гимназіяхъ раздѣляется на 7 классовъ; для каждаго назначается по одному году.

§ 144. Въ оныхъ преподаются: 1) Законъ Божій, Священная и Церковная Исторія. 2) Россійская Грамматика, Словесность и Логика. 3) Языки: Латинскій, Нѣмецкій и Французскій. 4) Математика до коническихъ стѣеній

включительно. 5) Географія и Статистика. 6) Исторія. 7) Физика. 8) Чистописаніе, Черченіе и Рисованіе.

Гл. IV.—О Гимназіяхъ.

§ 134. Урежденіе Губернскихъ Гимназій имѣть цѣль двоякую: доставить способы личнаго по званію ихъ воспитанія тѣмъ изъ молодыхъ людей, кои не намѣрены, или не могутъ продолжать ученіе въ Университетахъ; а готовящихся вступить въ оныя, снабдить необходимыми для сего предварительными знаніями.

Figure 1. The charter of the gymnasiums and schools of the county and parish, which are in the department of the universities of St. Petersburg, Moscow, Kazan and Kharkov, 1828

Source: Collection of resolutions on the Ministry of Public Education. Vol. 2. The reign of Emperor Nicholas I. 1825—1855. Department one. 1825—1839. Saint Petersburg: Type. The Russian Academy of Sciences, 1864. P. 176–177.

The gymnasium program spanned seven years. In accordance with the aforementioned “Charter for Gymnasiums, District and Parish Schools”, the curriculum comprised a variety of subjects (Figure 2).

The study of physics typically started in the 6th grade of the gymnasium and continued for two years. Therefore, the senior grades, for which N.T. Shcheglov’s textbook “Foundational principles of physics” (1834) was recommended, consisted of adolescents aged 16–17 (Figure 3).

In 1871, a new charter for educational institutions was ratified. According to the new charter, the duration of gymnasium education was extended from seven to eight years. That time the curriculum of the eight-year gymnasium included Divinity, Russian with Church Slavonic and Literature, Fundamentals of Logic, Latin and Greek, Mathematics, Mathematical Geography, German, French, and Penmanship as well. Physics was likewise taught in the senior grades; consequently,

the «Physics textbook: a course for secondary educational institutions» by K.D. Kraevich was written for young people aged 16–18.

§ 145. Въ Гимназіяхъ, состоящихъ при Университетахъ, обучаютъ и языку Греческому. По мѣрѣ нужды и возможности, преподаваніе онаго будетъ вводимо и въ прочія Губернскія Гимназіи.

§ 146. Преподаваніе раздѣляется между Учителями слѣдующимъ образомъ: 1) обучаетъ Закону Божію, Священной и Церковной Исторіи; 2) Логикѣ и Россійской Словесности; 3) Россійской Грамматикѣ и Географіи; 4) Исторіи и Статистикѣ; 5) Математикѣ; 6) высшимъ частямъ Математики и Физикѣ; 7) и 8) Латинскому языку; 9) Нѣмецкому; 10) Французскому; 11) Рисованію и Черченію.—Въ Гимназіяхъ, гдѣ введено преподаваніе Греческаго языка, для сего опредѣляется особый Учитель.

§ 147. Въ областяхъ, гдѣ мѣстный языкъ не есть Россійскій, назначается Учитель для преподаванія правилъ сего языка. Обучающіеся оному, могутъ, съ разрѣшенія Директора, быть увольняемы отъ классовъ Нѣмецкаго, или Французскаго.

Figure 2. The charter of the gymnasiums and schools of the county and parish, which are in the department of the universities of St. Petersburg, Moscow, Kazan and Kharkov, 1828

Source: Collection of resolutions on the Ministry of Public Education. Vol. 2. The reign of Emperor Nicholas I. 1825–1855. Department one. 1825–1839. Saint Petersburg: Type. The Russian Academy of Sciences, 1864. P. 178.

Гл. I.—I. Общія положенія.

§ 1. Гимназіи имѣютъ цѣлію доставлять воспитывающемуся въ нихъ юношеству общее образованіе, и вмѣстѣ съ тѣмъ служатъ приготовительными заведеніями для поступленія въ Университетъ и другія высшія спеціальныя училища.

§ 2. Въ Гимназіи полагается семь классовъ съ годичнымъ курсомъ въ каждомъ изъ первыхъ шести классовъ и съ двухгодичнымъ курсомъ въ высшемъ седьмомъ классѣ, причемъ преподаваніе въ этомъ классѣ располагается такъ, чтобы ученики старшаго и младшаго его отдѣленій были обучаемы вмѣстѣ. Впрочемъ, въ видѣ исключенія изъ общаго правила, отличнѣйшіе изъ учениковъ VII класса, по опредѣленію Педагогическаго Совѣта и съ разрѣшенія Попечителя учебнаго округа, могутъ быть допущены и по окончаніи перваго года ученія въ VII классѣ къ окончательному испытанію изъ всего гимназическаго курса въ полномъ его объемѣ и, бу-

Figure 3. The charter of gymnasiums and progymnasiums of the Ministry of Public Education 1871

Source: Collection of resolutions on the Ministry of Public Education. Vol. 5. The reign of Emperor Alexander II. 1871–1873. Saint Petersburg: Type. V. S. Balashev, 1877. P. 431.

In the USSR, children were enrolled in school at age of seven, where they completed a ten-year program. The study of physics started in the sixth grade; this led us to the conclusion that the target audience of “Physics: textbook for the 6th grade of secondary school” by A.V. Peryshkin, E.Y. Minchenkov, V.V. Krauklis consisted of 12–13-years-old adolescents.

In the modern Russian school system pupils begin their educational process, which spans eleven years, at the age of six or seven. The teaching of physics typically starts in the 7th grade, although it may be introduced a year earlier in gymnasiums and lyceums. Thus, the target audience for the «Physics: textbook for the 7th grade in two parts» by L.E. Gendenstein, A.B. Kaydalov consists of students from 12 to 14 years old.

On the formal characteristics of the scientific style found in the selected textbooks fragments

Here are four main formal characteristics of the scientific style: objectivity, logicity, informativeness and factual accuracy (Table 1).

Table 1. Characteristics of the scientific style

Characteristic	Explanation
Objectivity	Presenting the object as it exists, independently of the subject; an impartial presentation of information
Logicity	A sequential, consistent, well-reasoned presentation of information
Informativeness	Saturation of the presentation with a sufficient amount of information about the object
Factual Accuracy	Correct presentation of facts about the object: providing information that does not contradict reality, avoiding understatements and exaggerations

Source: compiled by Anna A. Romanenko.

We found in all selected fragments commonly used, general vocabulary. However, the total number and the usage of scientific terms in these texts was different. For instance, in the textbook by N.T. Shcheglov, the analyzed preface fragment introduces students to fundamental concepts of physics and contains eight scientific terms, such as *matter, substance, physical body, forces, phenomena, properties of bodies, physical world, nature*.

The introduction to K.D. Kraevich’s textbook informs students about inventions which, according to the author’s point of view, significantly influence the development of scientific research methods and practical applications. It contains ten scientific terms, such as *law, Gram magnetoelectric machine, Gram dynamoelectric machine, gas liquefaction, Regnault device, Stehrer magnetoelectric machine, Forteny barometer*.

The school physics textbook written by A.V. Peryshkin, E.Y. Minchenkov, V.V. Krauklis, does not have a separately preface or an introduction part. However, its first chapter, much like the introduction in N.T. Shcheglov’s textbook,

familiarizes students with the fundamental concepts of physics. This fragment contains ten scientific terms: *physical body, body, substance, physical phenomena, movement of bodies, sound phenomena, thermal phenomena, electrical phenomena, magnetic phenomena, light phenomena*.

In contrast to the three previous textbooks, the preface in the modern textbook does not present any information on the essence of the subject being studied, nor does it contain any details regarding to the fundamental concepts of physics. We couldn't identify a single scientific term in this text fragment. Authors preferred to use neutral vocabulary, formal collocations and business vocabulary, such as: *second-generation standard, requirements of the standard, two tiers of subject's study — basic and advances, corresponds to the basic level*. This preface discusses the textbook's compliance with the requirements set by the school administration or other higher authorities (Table 2).

Table 2. Terms used in introduction part

Parts of textbooks (Introduction)	Terminology	Total number of terms
N.T. Shcheglov "The initial foundations of physics" (1834)	matter, substance, physical body, forces, phenomena, properties of bodies, physical world, nature	8
K.D. Kraevich "Textbook of physics. The course of secondary educational institutions" (1880)	law, Gram magnetoelectric machine, Gram dynamoelectric machine, mercury pump, Mendeleev barometer, gas expansion coefficient, gas liquefaction, Regnault device, Stehrer magnetoelectric machine, Forteny barometer	10
A.V. Peryshkin, E.Ya. Minchenkov, V.V. Krauklis, G.K. Karpinsky "Physics. Textbook for the 6th grade of secondary school" (1960)	physical body, body, substance, physical phenomena, movement of bodies, sound phenomena, thermal phenomena, electrical phenomena, magnetic phenomena, light phenomena	10
L.E. Gendenstein, A.B. Kaidalov "Physics. Textbook for 7th grade in two parts" (2012)	Terms related to the branches of physics have not been found	0

Source: compiled by Anna A. Romanenko

In the fragment from chapters related to the topic "Substances and Bodies" across all analyzed textbooks, neutral lexicon is likewise employed; however, the quantity of terms differs substantially. For instance, whereas the fragment from the Shcheglov's textbook contains twenty-two terms, the corresponding fragment from the modern textbook contains only five terms. What can be clearly seen is the dominance of common vocabulary and a decrease in terminological saturation in the modern scientific text (Table 3).

As it is clearly seen from the table, the terms **body** and **substance** are used in all texts, that is logically related to the main topic "Bodies and Substances". Terms

such as **liquid**, **gas**, **gaseous state**, and **solid body** are often used in all textbook fragments except the modern one, as the modern textbook provides no information on the states of bodies or the properties of their constituent substances.

Table 3. Terms used in chapters, related to the topic «Substances and Bodies»

Parts from textbooks	Terminology	Total number of terms
N.T. Shcheglov “The initial foundations of physics” (1834)	substance, body, weighed matters, non-weighed substances, heat, light, electricity, solid body, gaseous body, drop-liquid body, internal forces, external forces, extension, impermeability, borehole, divisibility, formalism, self-efficacy, moveability, expandability, elasticity, mutual attraction	22
K.D. Kraevich “Textbook of physics. The course of secondary educational institutions” (1880)	substance, matter, body, visible world, simple bodies, elements, physical body, natural body, solid, hardness, movable, body condition, liquid, fluidity, gaseous state, gas, volume, pneumatic machine	18
A.V. Peryshkin, E.Ya. Minchenkov, V.V. Krauklis, G.K. Karpinsky “Physics. Textbook for the 6th grade of secondary school” (1960)	solid, body, liquid, volume, gaseous substance, gas, state of substance, property of substance, solid state, liquid state, gaseous state, casting	12
L.E. Gendenstein, A.B. Kaidalov “Physics. Textbook for 7th grade in two parts” (2012)	physical body, body, substance, mechanical phenomena, interaction	5

Source: compiled by Anna A. Romanenko

However, the remaining terminology used in the 19th-century textbooks differs from that of the mid-20th century and the modern period. Among the obsolete of semantically altered terms, we could identify the following lexical units: *самонедейственность* ‘self-inactivity’, *скважность* ‘porosity’, *капельно-жидкое тело* ‘drop-liquid body’, *естественное тело* ‘natural body’, *удободвижимый* ‘easily movable’, *взвешивание материи* ‘weighable matter’ and *ожигение* ‘liquefaction’.

In terms of terminological density, the 19th-century textbooks are nearly equal. In contrast, the use of terminology is highly limited in the modern textbook. The Soviet textbook occupies an intermediate position.

This discrepancy can be explained by the fact that the 19th-century textbooks provide the most detailed exposition of one of the initial topics in the physics course, whereas the information in the modern textbook is presented very concisely, briefly. The students’ age must also be taken into consideration: the textbooks by N.T. Shcheglov and A.K. Kraevich were intended for an elder audience, a feature linked to the structure of the educational system in the Russian Empire, whereas the textbooks published in the USSR and modern Russia were written and modified for middle school students.

The analyzed fragments of school physics textbooks exhibit a high level of objectivity

By focusing on the properties of the described substances, N.T. Shcheglov and K.D. Kraevich consciously avoid the use of evaluative language. Furthermore, they explicitly acknowledge that certain substances and their properties, at the time of the textbook's compilation, might not have been fully studied — a formulation absent from both Soviet and contemporary school physics textbooks. In contrast, the authors of the latter present scientific facts as definitive, omitting any indication for the student that research methodologies are subject to ongoing development and refinement (Figure 4).

земли нашей какъ твердыя, такъ и жидкія. *Вещества* независимами называются начала теплоты, свѣта, электричества, столь поныня, что ихъ ни въ какомъ сосудѣ мы удержишь не въ состояніи. Онѣ, по видимому, вовсе не составляютъ тѣлъ осазаемыхъ, не подлежатъ извѣщанію, и концы отношенія какъ между собою такъ и къ тѣламъ въсომымъ еще недовольно извѣстны.

тѣла калція и кислорода. Извѣстны 68 веществъ, неразложённыхъ до сихъ поръ на составныя части, и изъ которыхъ состоятъ всѣ тѣла природы; они называются *простыми тѣлами* или *элементами*; таковы: кислородъ, водородъ, азотъ, хлоръ, углеродъ, сѣра, фосфоръ, желѣзо, серебро, мѣдь и проч. Простыя тѣла рѣдко встрѣчаются въ природѣ отдѣльно, но обыкновенно въ соединеніяхъ по два, по три и болѣе.

Figure 4. Parts from school physics textbooks.

Source: N.T. Shcheglov “Foundational principles of physics”. Saint Petersburg. Typ. H. Ginze, 1834; Textbook of physics: course of secondary educational institutions: with many political aspects in the text and lithographed tables / comp. K. Krajevich. 10th ed., revision and supplement. Saint Petersburg: V. Bezobrazov's Type and Comp., 1889. P. 3.

Assessing the level of evaluative language in the excerpt from the modern school physics textbook is challenging, as the material is presented concisely, using simple, common vocabulary and a limited number of scientific terms. Logically and coherence in the presentation of material are observed in only two of the four analyzed textbook excerpts: namely, those by N.T. Shcheglov and K.D. Kraevich. In these school physics textbooks, the authors introduce several concepts and then proceed to elaborate on each one sequentially, following the order of its introduction. The exposition consistently moves from the general to the specific.

A.V. Peryshkin, E.Y. Minchenkov, V.V. Krauklis, and G.K. Karpinsky adhere to the expository method — from the general to specific. They first list the states of matter in nature and then provide a characterization for each state. In contrast, the authors of the modern school physics textbook deviate from this described expository principle. As noted previously, L.E. Gendenstein and A.B. Kaidalov present the material briefly, direct students to other sections of the textbook for additional information on the topic, and, without first explaining the properties and types of bodies and substances, proceed directly to a discussion of how these bodies interact.

Neural Network Assistants as a New Source of Knowledge

The analysis of the evolution of the language of Russian school textbooks and other school subjects should be considered in the context of modern realities, where digital assistants and large language models (LLM) became a source of information for students. It means that neural networks are forming a new channel of communication between the scientific knowledge and the student. Unlike the static text of school textbook, neural networks present interactive and dynamic responses to user requests, adjusted to the context [10].

From a terminological perspective, the responses of neural networks to physics questions exhibit a hybrid character. Its simultaneously engage with scientific terminology embedded within training corpora — which includes canonical textbooks — while demonstrating a marked preference for conversational and public discourse styles. This stylistic inclination aligns neural networks more closely with the approach of modern educational materials, such as the textbooks of L.E. Gendenstein. Furthermore, driven by an impetus toward the visualization and annotation of content, LLM frequently demonstrate a tendency to reduce terminological density and effacing of canonical features of the traditional scientific style [11]. Traditional models classify text genres by identifying common patterns in vocabulary, meaning, grammar and discourse [12].

Consequently, neural network assistants exemplify and amplify a broader trend in educational materials: a shift from an objective, logically structured, and terminologically dense exposition toward a more simplified, hybrid style. The following examples of AI-generated text illustrate this shift.

Example 1

Request to ChatGPT: (1) *Объясни, что такое электрический ток?*

Response of ChatGPT: (2) *Представь себе реку. Вода в ней течет потому, что есть уклон. Электрический ток — это тоже своего рода река, только течет в ней не вода, а крошечные заряженные частицы — электроны. Они бегут по проводнику, например, по медному проводу, когда мы подключаем его к батарееке... ‘Imagine a river. The water in it flows because there is a slope. An **electric current** is also a kind of river, but what flows in it is not water, but tiny **charged particles** — **electrons**. It runs along a **conductor**, for example, a copper wire, when we connect it to a battery’⁶.*

While scientific terms such as *electric current*, *charges particles*, *electrons* and *conductor* are present, it is embedded within a domestic analogy (e.g., *river*, *slope*). This framing blurs the boundaries of a strict terminological field. In a conversational style, such analogies have served as auxiliary illustrative tools, but it is not typically positioned as the foundational basis of an explanation. The text’s objectivity is further diminished by its reliance on metaphorical expressions. Although a logical sequence is present, it lacks rigor; notably, the introduction of a

⁶ ChatGPT-4.5. URL: <https://openai.com/index/introducing-gpt-4-5/> (accessed: 10.06.2025).

concept should be followed by its formal definition, a convention not observed in generated text.

Example 2

Request to Gemini ('Google'): (3) *Сформулируй второй закон Ньютона.*

Response of Gemini ('Google'): (4) *Второй закон Ньютона — это фундаментальный принцип, который буквально управляет движением в нашей Вселенной. Если просто, то он говорит вот что: ускорение тела прямо пропорционально силе, которая на него действует, и обратно пропорционально его массе. Проще говоря, чтобы сильнее разогнать объект, нужно сильнее толкнуть...* 'Newton's second law is a fundamental principle that literally governs motion in our universe. **Simply put**, it **states that** the acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass. In other words, to accelerate an object more, you need to push it harder...' ⁷.

The contextual framing diverges from canonical scientific writing. The text incorporates features of a public style, such as the phrase *буквально управляет движением в нашей Вселенной* 'literary drives the movement in our universe', which creates an effect of heightened significance. A twofold simplification is evident: first, using colloquial vocabulary and phrasing (e.g., *говорит вот что* 'it states that'); second, through explicit metacommentary like *если просто* 'simply put', which signals a conscious departure from a rigorous scientific register toward a popular-science style. Consequently, objectivity is compromised by inclusion of emotional and evaluative expressions. The traditional scientific style typically avoids such epithets in its exposition, making the mode of presentation distinctly different from the established canonical texts.

Example 3

Request to Alice ('Yandex'): (5) *Почему небо голубого цвета, с физической точки зрения?*

Respond of Alice ('Yandex'): (6) *Солнечный свет, который кажется нам белым, на самом деле состоит из лучей разного цвета, как радуга. Проходя через атмосферу, этот свет сталкивается с молекулами воздуха. И вот тут самый важный момент: голубые и синие лучи рассеиваются сильнее всего, потому что у них короткая длина волны...* 'Sunlight, which appears white to us, it composed of rays of different colors, like a rainbow. As it passes through the atmosphere, this light collides with air molecules. And here is the most important point: blue and indigo rays are scattered the most because it has a short wavelength...' ⁸.

While key scientific terms are present (e.g. *солнечный свет* — 'sunlight', *атмосфера* — 'atmosphere', *молекулы воздуха* — 'air molecules', *длина волны* — 'wavelength', etc.), it is not presented as formal definitions. The text

⁷ Gemini 1.5 Pro. URL: <https://gemini.google.com/?hl=ru> (accessed: 17.09.2025).

⁸ YandexGPT-5.1 Pro. URL: <https://ya.ru/ai/gpt?ysclid=mhnayd05to265630578> (accessed: 15.09.2025).

further incorporates lexical items and syntactic structures characteristics of colloquial register, as seen in phrase such as, *И вот тут самый важный момент* — ‘here is the most important point’. This approach diminishes objectivity using evaluative and emotionally charged constructs. Although the presentation follows a logically and inquiry-based structure — moving from general principles to specific instances — it represents a simplified form of exposition that diverges from the expected rigor of the scientific style.

Conclusions

Thus, it can be established that 19th-century school physics textbooks (e.g., N.T. Shcheglov “Foundational principles of physics” (1834) and K.D. Kraevich “Physics textbook: a course for secondary educational institutions” (1880)) most fully conform to the criteria of the scientific style. The Soviet-era school physics textbooks “Physics for the 6th grade of secondary school” (1960) by A.V. Peryshkin, E.V. Minchenkov, V.V. Krauklis, and G.K. Karpinsky exhibits features of publicistic and colloquial styles, yet it remains a didactic variety of scientific literature. In contrast, the contemporary school physics textbook “Physics for the 7th grade in two parts” (2012) by L.E. Gendenshtein and A.B. Kaydalov cannot be characterized as scientific.

The responses generated by LLM have a hybrid style — a scientific-colloquial or *neuro-popular* register. Its primary aim is not merely to inform within the framework of scientific discourse, but to provide an interactive explanation, borrowing features of live communication, such as one might experience with a tutor. This presents a logical continuation of the evolution of the didactic style towards greater accessibility.

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