



Structural-Semantic Analysis of Scientific Terminology in English And Uzbek Languages

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Abstract: This article is dedicated to the structural-semantic analysis of scientific terminology in both English and Uzbek languages, focusing on the formation of terms used in scientific and technical fields, their semantic systems, stages of development, and translation issues. The paper examines the historical development of scientific terminology in the Uzbek language, analyzing the adaptation of words borrowed from other languages, including Arabic, Persian, Russian, and English. It also discusses the morphological and semantic structures of scientific terms, their cultural and linguistic significance, and the need for accurate identification and interpretation of contextual meanings of words. The article is focused on studying the processes of creating and standardizing scientific terms, as well as efforts to enhance the effectiveness of the Uzbek language in scientific communication.

Keywords: Scientific terminology, Uzbek language, semantics, morphology, translation, polysemy, structural-semantic analysis, scientific terms, globalization, lexicography, linguistics.

Introduction: Scientific terminology refers to a set of terms or words that express both specific and abstract concepts in scientific and technical fields. At the present stage of scientific development, the advancement of global communication and information technologies has led to an increasing interaction between scientific and technical terms in foreign languages (primarily

English) and national languages. The Uzbek language, too, faces several challenges in the process of shaping its scientific terminology. One of the major challenges is adapting terms and new concepts borrowed from English while preserving the distinctiveness of national language, science, and culture. This article presents a structural-semantic analysis of scientific terminology in both English and Uzbek. The objective is to identify the differences between these two languages from the perspectives of linguistics, morphology, and semantics, and to show how these differences should be taken into account in scientific communication.

Terminology is a system of terms that define specific concepts in various scientific and technical fields. The accurate and clear expression of terms ensures the effectiveness of scientific communication. Terminology studies the formation of words and phrases in scientific fields, as well as their structural and semantic aspects. The primary function of scientific terms is to express scientific and technical information clearly and understandably. These terms not only communicate information precisely but also facilitate the advancement of scientific research and the development of new knowledge.

There are two main aspects of terminology that can be distinguished:

1. Structure – the morphological structure and syntactic characteristics of terms.
2. Semantics – the meaning of terms and their interrelations with other terms.

Structure and Semantics of Scientific Terms in English

English is widely used as a global language in science and technology. Scientific terms in English are often based on roots borrowed from other languages, particularly Greek, Latin, and Arabic. These terms frequently appear in the following morphological forms:

1. Attached Morphemes – Scientific terms in English often consist of combined or attached morphemes. For example, the word thermodynamics is formed by combining the root thermo- (heat) and the suffix -dynamics (motion). This structural formation ensures a concise and clear expression of the scientific term.
2. Words Introduced by Acronyms – Many scientific terms in English are used in the form of acronyms or abbreviations, which are simplified versions of longer terms. For example, DNA (deoxyribonucleic acid), laser (light amplification by stimulated emission of radiation) are abbreviations of more complex scientific phrases.
3. Multilayered Semantic Complexities –

Scientific terms in English sometimes consist of several interrelated concepts. This is often achieved by combining multiple words, which reveals the unique semantic dimensions of the term. For example, quantum mechanics and electromagnetic spectrum are terms that combine multiple concepts to describe complex phenomena.

Semantics of Scientific Terms in English and Uzbek

In the semantics of scientific terms in English, contextual approaches are often present. For example, the word evolution can refer to a biological process, but it may also be used in the context of social or economic development. Here, the expansion of semantics encompasses both general and specialized meanings of terms.

Scientific terminology in Uzbek has historically been shaped by the integration of words borrowed from Arabic, Persian, Russian, and other languages. While retaining its unique features in terms of pronunciation, syntax, and grammar, the Uzbek language has undergone changes in the process of developing scientific terminology. The formation of scientific terms in Uzbek includes the following directions:

1. Use of Arabic and Persian Roots – Historically, many Uzbek scientific terms have been enriched with Arabic and Persian words. For example, terms like falsafa (philosophy), kimyo (chemistry), and matematika (mathematics) are widely used in Uzbek.
2. Creation of New Scientific Terms – In the process of creating new terms in scientific and technical fields, the possibilities of the Uzbek language are being expanded. Some English terms are being adapted into national equivalents. For instance, kompyuter (computer), internet (internet), and menedjment (management) are examples of terms that have been localized into Uzbek.
3. Borrowed Words – Scientific terms borrowed from English, Russian, and other languages undergo phonetic and morphological changes in Uzbek while retaining specific meanings. These words are often used in their adapted forms in Uzbek, although their grammatical rules may not align with the systems of the original language.

From a semantic perspective, scientific terms in Uzbek are more closely related to national concepts, and in some cases, the same English term may have different meanings in Uzbek. For example, while the word evolution refers to a biological process in English, in Uzbek, it may express broader meanings such as rivojlanish (development) or taraqqiyot (progress).

The scientific terms in English and Uzbek differ significantly in structure. English terms are often formed

through prefixes, suffixes, and acronyms, which allow for the precise expression of meanings. In contrast, Uzbek scientific terms rely more on Arabic, Persian, and Russian roots, which requires a semantic adaptation in the Uzbek language. Moreover, Uzbek scientific terms are often rooted in national and historical contexts, whereas English terms tend to be more universal and global in nature. This can, in turn, lead to some ambiguities or misunderstandings in scientific communication.

Scientific Terms in Uzbek

In Uzbek, scientific and technical terminology has developed in relation to the growth of the national language and its connections with international relations. Scientific terms can be based on words borrowed from other languages or on unique lexical elements of the Uzbek language itself. These terms have evolved in accordance with the semantic, morphological, and syntactic systems of Uzbek, and they serve as an essential tool for scientific communication and the exchange of knowledge.

To understand the characteristics of scientific terms in Uzbek and their development process, the following key aspects can be considered:

1. Formation of Scientific Terminology in Uzbek

Scientific terms in Uzbek have formed over various historical stages based on words borrowed from different languages. During this process, words from Arabic, Persian, Russian, English, and other languages have either been adapted to Uzbek grammatical forms or have been directly adopted. However, these borrowed terms are often modified to fit the phonetic, morphological, and syntactic systems of Uzbek, resulting in distinct features that reflect the language's unique structure.

a) Use of Arabic and Persian Roots

The scientific terminology in Uzbek has been enriched with many Arabic and Persian words. The formation of early Uzbek scientific terminology is closely linked to the development of Eastern science. Many scientific terms in the Uzbek language are based on Arabic and Persian roots. Examples include:

Kimyo (Arabic al-kimya – chemistry)

Falsafa (Persian falsafah – philosophy)

Matematika (Greek matematika – mathematics)

b) Words Borrowed from Russian and Other European Languages

The development of science and technology in the 19th and 20th centuries, particularly during the Russian Empire, required the adaptation of numerous Russian scientific terms into the Uzbek language.

Russian roots are widespread in Uzbek scientific terminology. Examples include:

Elektr (Russian elektr – electricity)

Avtomobil (Russian avtomobil – automobile)

Fizika (Russian fizika – physics)

In recent years, English has become the dominant global language of science and technology, and its influence has extended to Uzbek scientific vocabulary as well. English words are often either directly borrowed into Uzbek or adapted to the Uzbek language. Examples include:

- Kompyuter (English computer – computer)
- Internet (English internet – internet)
- Marketing (English marketing – marketing)

2. Morphological Analysis of Scientific Terms in Uzbek

The morphological analysis of scientific terms in Uzbek illustrates how these terms are formed and structured. Often, scientific terms in Uzbek are created using prefixes, suffixes, or other morphological elements. Examples include:

The suffix -lik forms words that refer to fields of study, as in *biologiya + lik = biologiya* (biological field).

The suffix -shunos is used to denote experts or specialists in a particular field, such as *falsafashunos* (philosopher, specialist in philosophy) or *kimyoshunos* (chemist, specialist in chemistry).

Additionally, scientific terms in Uzbek often provide more precise and concise meanings because the morphemes within the words convey specific concepts related to the field of science or knowledge.

3. The Process of Creating New Scientific Terms in Uzbek

The creation of new scientific terms is particularly important during periods of rapid scientific and technological development. Several approaches exist in Uzbek for generating new scientific terms:

Morphological Adaptation: Scientific terms borrowed from other languages are adapted to fit the morphology of the Uzbek language. For example, terms like *kompyuter* (computer) and *internet* (internet) are adapted to Uzbek phonetics and grammar.

Calques: New terms are created by translating the structure of foreign terms into Uzbek, following the syntactic patterns of the language. For example, *elektron pochta* (email) and *kompyuter tarmoqlari* (computer networks) are calques of English terms.

Coining New Terms: In the field of Uzbek scientific linguistics, the process of creating new words continues. New terms are coined based on the lexical and morphological structure of the Uzbek language.

Examples include biorivojlanish (biodevelopment) and avtonom tizimlar (autonomous systems).

4. Scientific Terms and Semantics in Uzbek

From a semantic perspective, scientific terms in Uzbek express their meanings clearly and reliably. However, sometimes a single scientific term may acquire different meanings in various contexts. Polysemous words and their semantic shifts play an important role, especially in translation and terminology. For example: Rivojlanish (development): While the English word evolution may have various meanings in biological or social contexts, rivojlanish in Uzbek commonly refers to social and economic development or progress.

Furthermore, the semantics of scientific terms often evolve through the translation of terms from other fields. For example:

Elektronika (electronics) and kompyuter fanlari (computer sciences) are terms that have been shaped by modern technological changes.

5. The Role of Uzbek Scientific Terminology in Global Development

In recent years, the scientific terminology of the Uzbek language has become closely linked with global linguistic processes. As scientific terminology evolves in the world's scientific community, Uzbek scientific terms are also being updated. Uzbek is increasingly adopting scientific terms from English, which enhances the effectiveness of scientific communication in the language.

Furthermore, the development and standardization of Uzbek scientific terminology have been supported by government initiatives, including the creation of normative documents, such as dictionaries and resources that regulate scientific terms. These efforts contribute to the precise and effective communication of ideas in science and education.

Uzbek scientific terms, based on a rich historical legacy, include words borrowed from various languages. Terms derived from Arabic, Persian, Russian, and English roots have been adapted to the Uzbek language or new terms have been created. At the same time, the semantics and morphology of scientific terms have evolved, facilitating the expression of clear and understandable terms in scientific communication and education.

The development stages of Uzbek scientific terminology have been shaped through historical processes and interactions with other languages. These stages have led to consistent changes in the scientific and technical fields. By identifying these stages, we can analyze the process of change in scientific terminology and understand how it is

evolving today.

1. Early Stage (13th–18th centuries) – Influence of Eastern Science and Arabic, Persian Roots

The initial phase of Uzbek scientific terminology was based on the scientific heritage of the Middle Ages. During this period, many scientific terms in Uzbek were derived from Arabic and Persian roots, particularly in fields like science, philosophy, medicine, and astronomy. These terms were introduced under the influence of the Islamic world, where scientific schools flourished.

Scientific terms from Arabic and Persian became widely used in fields such as chemistry, philosophy, medicine, and astronomy. The process of adopting these terms involved adapting Arabic and Persian words to the phonetic and grammatical systems of the Uzbek language. Examples of terms that entered Uzbek scientific language include kimyo (chemistry), falsafa (philosophy), matematika (mathematics), and hikmat (wisdom).

2. Second Stage (19th century – Early 20th century) – Russian Influence and the Transition to a New Phase of Scientific Terminology

In the middle of the 19th century, with the increasing influence of the Russian Empire in the Uzbek lands, Uzbek scientific terminology began to incorporate many words and scientific concepts from the Russian language. During this period, the development of science and technology led to the necessity of creating new scientific terms in Uzbek.

Adoption of Russian Scientific Terms: A large number of scientific terms were adopted from Russian, such as fizika (physics), kimyo (chemistry), elektr (electricity), avtomobil (automobile), and geografiya (geography).

Lexical Guides and Dictionaries: During this stage, the first efforts to compile scientific lexicons, lexicography, and terminology guides in Uzbek were made, laying the foundation for further development in the field.

3. Third Stage (20th century – Until the 1990s) – Development of Uzbek Scientific Language Toward Independence

After the second half of the 20th century, particularly following Uzbekistan's independence, the scientific terminology of the Uzbek language entered a new phase of development. During this time, a key focus was on nationalizing terms borrowed from Russian and other languages, as well as adapting new scientific concepts to Uzbek.

The independence period marked a turning point where efforts intensified to create a more distinct Uzbek scientific language, one that would preserve national identity while still keeping pace with global scientific

advancements. This phase also involved the creation of new terms to reflect modern scientific knowledge and developments in technology, ensuring that the Uzbek language could express new concepts without losing its connection to its historical and cultural roots.

3. Nationalization: Adapting Scientific Terms to the Uzbek Language's Morphological and Phonetic Systems

Special attention has been given to adapting scientific terms to fit the morphological and phonetic structures of the Uzbek language. Terms borrowed from Russian and other languages have been adjusted to Uzbek forms. For example: kompyuter (computer), telefon (telephone), internet (internet).

4. Creation of New Terms:

Some terms, such as *biologiya* (biology), *elektronika* (electronics), and *kosmonavtika* (cosmonautics), were either newly created or adapted based on the morphological structure of the Uzbek language.

4th Stage (1991 – Present) – Globalization and the Influence of English Terms

After Uzbekistan gained independence, the dominance of the English language in global scientific and technical fields, along with international relations and modern technologies, led to significant changes in Uzbek scientific terminology. During this period, the need to incorporate English scientific terms and concepts emerged.

- **English Terms:** Many scientific terms directly borrowed from English have entered the Uzbek language without much alteration. Examples include *kompyuter* (computer), *internet* (internet), *robot* (robot), *marketing* (marketing), *menedjment* (management), and others.
- **Contextual Approach:** Some English words are used in their exact form, but are adapted to fit the national language. Simultaneously, scientific terms are being aligned with the semantic system of Uzbek.

5th Stage (Future) – Standardization and Optimization of Scientific Terminology

In the future, Uzbek scientific terminology will continue to evolve to align with global scientific communication and international relations. This process will emphasize the standardization of scientific terms and their integration into universally accepted norms.

- **Standardization:** The standardization of Uzbek scientific and technical terminology is crucial to ensure that a unified system is adopted across all fields, with consistent terms used in scientific communication.
- **Creation of New Terms:** As new technologies

and scientific discoveries emerge, the need to create new scientific terms based on these advancements will become increasingly important.

- **Maintaining National Identity:** While integrating global technologies and scientific innovations, it is essential to preserve the unique features of the Uzbek language, ensuring its continued development and effectiveness in international communication.

CONCLUSION

The development stages of scientific terminology in Uzbek are interconnected and encompass complex processes. These stages have unfolded through historical phases and are aimed at ensuring that the scientific language finds its place within global linguistic processes. The future of Uzbek scientific terminology lies in its ability to maintain its distinct national identity while continuing to participate actively in global scientific communication by embracing international connections and innovations.

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