

ARTIFICIAL LANGUAGE

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November 9, 2025

RECOMMENDED CITATION

mohammad looti (2025). *ARTIFICIAL LANGUAGE*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=65424>

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Primary Disciplinary Field(s): Linguistics, Computer Science, Logic, Mathematics, Philosophy

1. Core Definition

An **artificial language**, often abbreviated as ARTLANG, is any language or linguistic system that has been deliberately constructed, invented, or engineered by humans, rather than having evolved naturally within a speech community over long periods of time. This fundamental distinction separates ARTLANGs from **natural languages** (NATLANGs), such as English, Mandarin, or Spanish, which arise from unconscious collective usage and tradition. Artificial languages are created with specific goals in mind, which may include simplifying international communication, standardizing logical thought, facilitating computation, or serving purely aesthetic and artistic purposes. The term encompasses a vast and diverse spectrum of systems, ranging from fully developed, human-usable auxiliary languages to highly specialized formal systems used exclusively in technical disciplines.

A crucial characteristic of an artificial language is its predetermined structure. Unlike natural languages, which are often characterized by inherent ambiguity, redundancy, and irregularity stemming from centuries of unmonitored usage, artificial languages typically possess explicit, formalized grammars and lexicons. These rules are defined prior to or during their implementation, ensuring consistency and precision. While some artificial languages, particularly those intended for human interaction (known as **constructed languages** or conlangs), strive to mimic the complexity and expressiveness of natural language, others prioritize mathematical rigor and unambiguous interpretation, serving as tools for exact representation and calculation, such as those found in modern programming and logical frameworks.

2. Classification and Typology

Artificial languages can be broadly categorized based on their intended purpose and domain of application. This classification helps differentiate between systems designed for general communication and those designed for highly specialized technical tasks. The three primary classifications are Constructed Languages (Conlangs), Formal Languages (used in logic and mathematics), and Programming Languages (used in computation).

Constructed Languages (Conlangs): These are languages intended for human communication, either as auxiliary international languages (auxlangs), fictional languages (artlangs), or engineered languages (engelangs). Examples include Esperanto, designed for political neutrality and ease of learning, or Klingon, created for fictional media. These languages prioritize human interaction and cultural expression.

Formal Languages: These are abstract mathematical systems defined by a precise set of rules for forming strings of symbols (syntax) and for assigning meaning to those strings (semantics). They are essential in fields like mathematical logic and set theory, where absolute clarity is required. Examples include propositional logic or the notation used in set theory. These languages are often highly restrictive, focusing solely on the expression of truth values and relationships between abstract objects.

Programming Languages: These are specialized subsets of formal languages used to communicate unambiguous instructions to a machine, typically a computer. They bridge the gap between human thought and binary execution. Languages like Python, Java, and C++ are **artificial languages** because their syntax and semantics are rigorously defined by specific standards and compilers, although they often incorporate features designed for human readability and error minimization.

3. Etymology and Historical Development

The concept of devising a universal or improved language dates back centuries, reflecting a persistent human desire to overcome the inefficiencies and ambiguities inherent in natural language. Early philosophical efforts, particularly during the 17th century Enlightenment, sought to create **philosophical languages** or *linguae philosophicae*. Thinkers like John Wilkins (with his *Essay Towards a Real Character and a Philosophical Language*, 1668) aimed to construct a language where the very structure and vocabulary mirrored the classification of knowledge and reality, thereby making logical errors almost impossible. These early attempts often failed due to the overwhelming difficulty of standardizing human knowledge and the inherent subjectivity involved in cultural classification.

The modern era of artificial language development truly took off in the late 19th century with the rise of international auxiliary languages (IALs). The most successful example is **Esperanto**, created by L. L. Zamenhof in 1887. Esperanto's goal was practical and social: to foster international understanding through a language designed to be easy to learn, neutral, and structurally regular. Its success demonstrated that artificial languages could gain real-world speakers and form functioning speech communities, a feat that distinguishes it from purely theoretical constructs and earlier philosophical systems.

In the 20th century, the landscape of artificial languages broadened dramatically with the advent of computing and formal logic. Mathematicians like Gottlob Frege and Bertrand Russell formalized the basis of mathematical reasoning using specialized artificial languages (e.g., predicate logic), ensuring precision that natural language lacked. This groundwork directly influenced the creation of the first **programming languages** in the 1940s and 1950s, such as Fortran and LISP, which operationalized formal systems into executable code. Thus, the history of artificial languages transitioned from philosophical aspirations to practical technological and logical necessities,

becoming fundamental tools for modern science and technology.

4. Key Characteristics

Artificial languages share several defining characteristics that differentiate them from natural languages, emphasizing design, precision, and purpose over organic evolution. These features are critical to their functionality in technical and formal settings.

Intentional Design and Construction: Artificial languages are created by one or more individuals or committees with a specific set of rules, lexicons, and objectives. Their existence is not the result of organic, communal evolution but of conscious planning. This allows for immediate revision, standardization, and formal documentation of the grammar, which is typically immutable unless explicitly changed by the designers or maintainers.

Regularity and Lack of Ambiguity: A primary goal in designing most artificial languages, especially formal and programming ones, is the minimization or elimination of ambiguity (polysemy, homonymy, and context-dependence). They strive for a one-to-one mapping between form and meaning, or at least a deterministically parsed structure. This characteristic is essential for computer execution and rigorous logical proof, where even minor semantic variance can lead to unacceptable errors or invalid conclusions.

Defined Scope and Learnability: While natural languages are technically infinite in their generative capacity and constantly evolving through neologisms and grammatical drift, artificial languages typically operate within a finite, defined set of grammar rules and a foundational lexicon. In the context of Conlangs, this is often leveraged to ensure high structural regularity, making them significantly easier for non-native speakers to acquire compared to the complex, irregular morphology and syntax found in NATLANGs.

Turing Completeness (For Programming Languages): A key functional characteristic of robust programming languages is that they are **Turing complete**, meaning they are theoretically capable of performing any calculation that a general-purpose computer can execute, provided sufficient time and memory. This functional requirement places programming languages far beyond the simple expressive capabilities of purely declarative or formal mathematical notations, making them executable and general-purpose tools.

5. Applications in Linguistics and Psycholinguistics

Beyond their practical uses in computation and formal logic, artificial languages serve a critical role as investigative tools within the cognitive sciences, specifically **linguistics** and **psycholinguistics**. Researchers utilize artificially constructed grammars to test hypotheses regarding universal grammar, language acquisition, and the neurological processing of linguistic rules, providing a level of experimental control unmatched by studying natural languages.

In psycholinguistic experiments, researchers often invent small, highly controlled artificial grammars to simulate aspects of natural language complexity or, conversely, to violate established natural-language rules or presumed linguistic universals. By teaching human subjects these novel grammars and observing their learning patterns, error rates, and neurological responses (often using fMRI or Event-Related Potentials or ERP), scientists can isolate and study specific cognitive mechanisms. For example, an artificial language might be constructed that strictly adheres to the principles of subject-verb-object ordering observed in many natural languages, and then compared against a grammar designed to violate this canonical principle, allowing researchers to determine if humans possess an innate processing bias toward certain structural configurations.

Furthermore, artificial languages are sometimes developed to model or simulate specific language disorders or developmental deficits, such as difficulties with agreement morphology or complex syntax. By systematically manipulating the complexity and specific features of an artificial grammar, researchers can gain insight into the specific components of the language processing system that may be impaired in conditions like aphasia or dyslexia. This experimental control over the linguistic input is virtually impossible using the sprawling, inconsistent data sets provided by natural languages, making ARTLANGs indispensable for rigorous, controlled experimentation into the nature of human language and cognition.

6. The Relationship to Natural Language

The relationship between artificial and natural languages is complex and often symbiotic. While artificial languages are fundamentally defined by what they are not--systems that did not evolve naturally--many ARTLANGs are deeply influenced by NATLANGs, especially those designed for human communication. Constructed languages, for instance, often borrow phonemes, morphological structures, and lexical roots from existing languages to enhance familiarity, aid pronunciation, and increase ease of learning, aiming for a degree of "naturalistic" feel.

Conversely, the formal rigor introduced by artificial languages has profoundly influenced the way theoretical linguists analyze natural language. The development of formal grammars in computer science, such as context-free grammars and finite-state automata, provided the mathematical tools necessary to model and analyze the syntactic structure of human languages. Pioneers like Noam Chomsky utilized mathematical models inspired by formal language theory to develop transformative theories of generative grammar, treating natural language capacity as a formal, computational system residing within the human mind. This interdisciplinary exchange demonstrates that while their origins differ, the analytical frameworks developed for artificial languages are essential for formalizing and understanding the underlying, often hidden, structure of natural language.

7. Debates and Criticisms

While artificial languages offer significant advantages in precision and experimental control, they are subject to several persistent criticisms, particularly concerning their utility for general human communication and their capacity to achieve the richness of natural language. A frequent criticism leveled against auxiliary constructed languages (auxlangs) is their perceived failure to achieve widespread adoption necessary to displace dominant natural languages like English, Spanish, or Chinese. Critics argue that the political, economic, and cultural inertia supporting NATLANGs is too powerful for any engineered language to overcome, relegating most Conlangs to niche, often non-native speaking, communities.

Furthermore, there is a substantial debate concerning the inherent limitations of intentional design; some scholars argue that the organic, unsupervised development of natural language imbues it with a cultural depth, idiomatic nuance, and expressive power that no deliberately constructed system can fully replicate. The inherent messy complexity of a natural language, derived from thousands of years of human interaction, is often seen as integral to its comprehensive functionality in conveying subtle social and emotional meanings that lie outside of simple logical propositions. This complexity is often intentionally designed out of ARTLANGs in favor of clarity.

In the realm of formal and programming languages, criticisms usually revolve around implementation issues, such as semantic drift (where the intended meaning of a command changes subtly over time or across different hardware implementations) and the inherent trade-off between power and readability. A highly concise and powerful formal language, designed for ultimate computational efficiency, may be extremely difficult for a human programmer to parse, maintain, and debug, leading to high rates of error. Therefore, continuous efforts are made in computer science to design languages that minimize this cognitive load, attempting to blend the unambiguous precision of artificial systems with the user-friendliness typically associated with natural communication.

Further Reading

[Constructed language - Wikipedia](#)

[Formal language - Wikipedia](#)

[Formal Logic \(Stanford Encyclopedia of Philosophy\)](#)

[Programming Language \(Encyclopedia Britannica\)](#)

[Psycholinguistics of artificial language acquisition - Wikipedia](#)