Teaching Innovations, Volume 37, Issue 3, pp. 136–144
DOI: 10.5937/inovacije2403136S

Marija M. Stanojević Veselinović[1]
University of Kragujevac, Faculty of Education, Jagodina, Serbia

Professional paper

Paper received: Feb 6 2024
Paper accepted: Apr 15 2024
Article Published: Oct 23 2024

Contribution of applying mathematical patterns to the acquisition of learning strategies in teaching German as a foreign language

Extended summary

The paper deals with an innovative methodological approach in learning a foreign language, in this case of German as a foreign language. The goal of the paper is to show the application of mathematical rules in the German language learning, as a way of improving the teaching and learning of German as a foreign language.

Logical patterns that are the basis of mathematics as a science, and are constantly enriched, especially at an early age, represent a type of positive transfer in learning German as a foreign language, especially of German grammar. Logical structuring is what mathematics and grammar have in common. Mathematics as a universal language is related to and corresponds to the definition of language, as mathematics and language require abstract thinking, use logical patterns, and have defined rules. It is often defined also as the science of structure. From the aspect of linguistics, there are areas such as syntax, semantics, vocabulary, and discourse, where grammatical rules are similar to or the same as some mathematical rules and patterns. Therefore, in syntax, the science of sentences, there are sentence patterns or frameworks for the correct order of words in a sentence. Of particular importance for the skill of speaking German language is a specific and precisely determined order of words, as there is a system, i.e., order of natural numbers. We use that system in order to acquire automaticity in giving answers in the German language and enrich the vocabulary. This approach can be applied also in the case of constructing imperative and interrogative sentences in the German language. Exceptions to the rule, of course, exist in both disciplines, to which certain rules cannot be applied. When it comes to semantics, the relationships between superordinate and subordinate concepts and, for

1 majastanojevic2@gmail.com;
https://orcid.org/0000-0002-8683-4940

example, dependent conditional sentences or clauses, we could use the basic logical operations to explain their deeper semantic structure with statements, such as: conjunctions, disjunctions, implications, equivalences, and negations. Also, the set is one of mathematical concepts that is applicable in the analysis of the semantic relations in language. For example, we can present the relationship between hyperonyms and hyponyms with a mathematical set: $A \subseteq B$.

These and other examples, presented in the paper, show that mathematics and language coincide in many segments, such as abstract thinking, logical patterns, and rules, and if we consider mathematics as a universal language, the paper presents an analysis of the positive transfer of mathematical patterns to language learning.

Additionally, the results of the research largely reflect the principles of the Generative Grammar theory, where the mechanisms for generating sentences have the properties of explicitness and prediction, that is, enumeration in the mathematical sense which determines the domain of its objects. To make a comparison, for example, a potentially infinite sequence of numbers (1, 3, 5, 7, 9...) is generated by the rule, start from 1 and add 2ˇ (Bugarski 1995: 196). Analogous to this rule, the generative grammar represents a system of rules that specifies the possible forms of all sentences in that language.

By applying the analytical skills acquired in mathematics, we facilitate the process of learning and understanding a foreign language. This makes the teaching and learning of foreign languages more interesting and the focus is constant. The established model of patterns significantly contributes to the improvement of teaching and learning German as a foreign language by presenting the ways in which not only the semantic rules of the sentences, but also other grammar rules in a foreign language can be adopted, as well as learning strategies and techniques.

Keywords: German language learning, methodological approach, mathematical pattern, transfer, rules of the German Language Learning

References

- Ašić, T. (2011). *Nauka o jeziku*. FILUM.
- Bogdanović, M., Stanković, M. i Tasić, M. (2019). *Elementarni matematički pojmovi*. Pedagoški fakultet u Vranju.
- Bugarski, R. (1995). *Uvod u opštu lingvistiku*. Čigoja.
- Chomsky, N. (1966). *Syntactic structures*. Mouton & Co.
- Chomsky, N. (1972). *Gramatika i um*. Nolit.
- Council of Europe (2020). *Common European Framework of Reference for Languages: Learning, teaching, assessment*. Companion volume, Council of Europe Publishing. https://rm.coe.int/common-european-framework-of-reference-for-languages-learning-teaching/16809ea0d4
- Courant, R., & Robbins, H (1973). *Šta je matematika? Elementarni pristup idejama i metodama*. Naučna knjiga.

- Lenzner, P., & Schirneck, M. (2022). *Grammatiken und die Chomsky-Hierarchie*. https://hpi.de/en/friedrich/teaching/units/grammatiken.html.
- Hemenway, P. (2009). *Tajni kod: Zlatni rez - tajanstvena formula koja vlada umjetnošću, prirodom i znanošću*. V. B. Z.
- Hoque, E. (2021). The Universal Grammar Theory. *The Journal of EFL Education and Research*. https://www.researchgate.net/publication/353637839_The_Universal_Grammar_Theory_Noam_Chomsky%27s_Contribution_to_Second_Language_SL_Education.
- Odlin, T. (1990). *Language transfer: cross-linguistic influence in language learning*. Cambridge University Press.
- Shara, J. (2016). *MATHEMATICS AND ART*. Department of Mathematics & Computer Science, Faculty of Natural Sciences, University „Eqrem Cabej". https://www.researchgate.net/publication/358210455_MATHEMATICS_AND_ART.
- Stanojević Veselinović, M. (2018). *Komparativni frazeologizmi za jezički par srpski-nemački* (doktorska disertacija). Kragujevac: FILUM.
- Šuvaković, A. (2015). *Nastava italijanskog jezika kao drugog stranog jezika u ranom uzrastu* (doktorska disertacija). Fililoški fakultet.
- Vujošević, N. (2018). Tu-morzova binarna sekvenca i principi rekurzije u Trećoj simfoniji Rra Norgala. U B. Mandić, i J. Atanasijević (ur.). *Srpski jezik, književnost, umetnost*: *Zbornik radova sa XII međunarodnog naučnog skupa. Knj. 3, Muzika znakova / znakovi u muzici i New Born Art* (str. 115–127). 27-28. X 2017. Filološko-umetnički fakultet, Univerzitet u Kragujevcu.