

## *List of scientific publications*

**on ch. Assistant Dr. Radostina Strahilova Vasileva-Tcankova,** submitted for participation in a competition for the occupation of the academic position *docent*, Field of higher education: 1. Pedagogical sciences, Professional direction 1.3. Pedagogy of education in... (Methodology of education in chemistry), announced by the Shumen University "Bishop Konstantin Preslavski", in State Gazette No. 4 / 13.01.2023.

### **I. Habilitation theses - Monographs:**

**1. Vasileva-Tcankova, R.** Possible semiotic approaches in teaching and learning chemical symbols in seventh and eighth grade, Monograph, Libra Scorp Publishing House, Burgas, 2022, ISBN 978-954-471-882-4.

**Abstract:** The monographic work is intended for students, teachers and researchers in the field of chemistry. Emphasis is placed primarily on learning the types of chemical symbols in seventh and eighth grade (chemical symbols, formulas, and equations). Chemical symbolism is an important component of the "chemical language" sign system, whose role, meaning and place in education have been repeatedly studied during the individual stages of the development of the methodology of teaching chemistry and pedagogical school practice.

This makes the monographic work extremely applicable, and the problem considered in it relevant, because modern requirements for the content of school education, which is studied in the discipline "Methodology of teaching chemistry" at the university, should include not only a system of knowledge and skills, but and information about the relevant methods of knowledge and practical activity that are applied in school. In this direction, the contributions of the First Chapter of the monograph are related to the presentation of the theoretical foundations of the problem of studying chemical symbolism as a component of the "educational chemical language" system.

The educational chemical language in the monograph is presented as a sign system, and the sign system, in turn, is presented through the essence of semiotics as a science.

In the Second chapter of the monograph, two large groups of approaches are considered: classical, described in the literature and new approaches in teaching Chemistry and environmental protection. The contribution here is the developed

didactic model of the Chemistry Learning Process system by applying semiotic approaches.

In Chapter Three, an experimental study on the influence of semiotic approaches on students' knowledge of chemical symbolism is presented. The main contribution is the development of a methodological system, including tasks, exercises and summary lessons in the teaching content of Chemistry and Environmental Protection for the seventh and eighth grades and the presentation of the results to establish the effectiveness of the developed methodological system.

**2. Vasileva-Tcankova, R.** Modern methods, approaches and technologies of teaching in Chemistry and environmental protection, Monograph, "Libra Scorp" Publishing House, Burgas, 2022, ISBN 978-954-471-883-1.  
(Monograph, which is not presented as the main habilitation thesis)

**Abstract:** The monograph was developed for the benefit of students - future teachers of Chemistry and Environmental Protection and teachers teaching this subject at school. The content of the individual chapters is properly distributed and the material presented in them is in an accessible and understandable language.

In teaching practice, a relatively low level of assimilation of chemical symbols is established, which is confirmed by the students' inability to use them in studied or similar situations. Insufficient meaningfulness and impermanence of knowledge is found, which leads to the mechanical learning of symbols and is the reason for lowering the interest and achievements of students in the specified subject. The problems associated with the successful introduction and learning of the components of the chemical language can be overcome by applying new ideas in creating an optimal methodology for teaching the basic chemical notations.

In the First Chapter of this monograph, the contribution is aimed at setting the theoretical foundations of the problems regarding the tasks, content and methods of teaching Chemistry and Environmental Protection. The methodology of teaching chemistry as a science, the requirements regarding the knowledge and skills of students according to the State Educational Standards (DOS / DOI), as well as the goals and tasks of teaching Chemistry and environmental protection are presented.

In Chapter Two, the contribution is that the modern approaches in teaching Chemistry and environmental protection are presented in a different way, such as a situational approach, a competence approach, a constructivist approach, a reflexive approach and an ecological approach.

In the Third Chapter of the monographic work, modern pedagogical technologies in the teaching of Chemistry and environmental protection are

presented in a different way from the previously known educational, pedagogical and didactic technologies.

## **II. Articles published in scientific publications, referenced and indexed in world-renowned databases of scientific information:**

**1. Antonova, L., Galcheva P., Vasileva R.** Using a semantic approach when entering chemical equations. In: Chemistry, item X, vol. 5, 2001, pp.309-316.

**Abstract:** The purpose of this article is to explore the possibilities of the semantic approach for familiarizing 7th grade students with chemical equations. The semantics of chemical symbols, which are components of chemical equations, is shown in the article with the help of generalized schemes. For their introduction, the logical path from the symbol to its meaning was used. The meaning of the changes in the proposed version of the topic "Chemical equations" is to reverse the logic of the discussed schemes. Students' reasoning is turned from meaning to symbol. This approach creates conditions for students' flexible thinking, as well as two-way movement of the learning process, which is the idea of the semantic triangle.

**Keywords:** semantic approach, semantics, chemical symbols, chemical equation.

**2. Antonova, L., Vasileva-Tcankova R.** Semiotic approaches in studying chemical symbols. In: Chemistry, item XVII, vol. 3, 2008, pp. 181-191.

**Abstract:** Three new approaches to teaching and learning in chemistry and environmental protection are proposed. The general semiotic approach can be divided into three particular approaches – semantic, pragmatic and syntactic. They are particularly methodological, because they arise from the specific features of the science of chemistry and the study subject "Chemistry and environmental protection". Fragments of the learning content are shown where chemical symbolism is introduced through these new approaches. It has been established that the described methodology leads to an improvement in the results of learning chemistry and environmental protection in secondary school.

**Keywords:** teaching and learning in chemistry and environmental protection, semiotic approaches, semantic, pragmatic and syntactic approaches in chemistry.

**3. Vasileva-Tcankova, R.** Didactic model of the “Chemistry training process” system when applying semiotic approaches. *Acta Scientifica Naturalis*, Vol. 9, No 2, Pages 25–33, 2022, DOI: <https://doi.org/10.2478/asn-2022-0012>, Journal homepage: <https://content.sciendo.com/view/journals/asn/asn-overview.xml>

**Abstract:** The present development uses the modeling method described in the literature and proposed a new didactic, functional model of the "chemistry training" system in the application of semiotic approaches: semantic, pragmatic, and syntactic. The main objective of creating such a model is to demonstrate the specific activities of the subjects "teacher" and "pupil" when familiarizing themselves with chemical symbols and their study by students. The added new components in the model "Technology of chemistry training", "Semiotic information" and the clarified links between them, lead to a complete change in the way the described system works. The developed didactic model makes it easy to guess the relationship between a new learning situation and a result, that is, to predict an unknown process or phenomenon. This model makes it possible to formulate a reasoned hypothesis of the study.

**Keywords:** model, modeling method, Chemistry training process system, Chemistry training technology and semiotic information components, semiotic approaches, semantic approach, pragmatic approach, syntactic approach.

**4. Vasileva – Tcankova, R.** Experimental study on the impact of semiotic approaches on students' knowledge of chemical symbolism in seventh and eighth grade. *Acta Scientifica Naturalis*, Vol. 9, No 2, Pages 34 - 62, 2022, DOI: <https://doi.org/10.2478/asn-2022-0013>, Journal homepage: <https://content.sciendo.com/view/journals/asn/asn-overview.xml>

**Abstract:** Experimental work in its milestones is carried out according to the following algorithm:

1. Development of a methodological system, including additional training content in Chemistry and Environmental Protection for the seventh and eighth grades /purposefully selected urological fragments, exercises and summary lessons/, in which the subject of study is chemical symbolism, with the application of semiotic approaches - semantic, pragmatic and syntactic;

2. Conducting a pedagogical experiment to establish the effectiveness of the developed methodological system;

3. Analysis of the results of the pedagogical experiment.

The pedagogical experiment is included in the work as the main method of researching the influence of semiotic approaches on the knowledge and skills of students for the proper use of chemical symbols. By conducting a pedagogical experiment, it has been shown that the use of the three semiotic approaches in

Chemistry and environmental training facilitates and improves the understanding of the complex meaning of chemical symbols by students. The analysis of the results of the written control works in the seventh and eighth grades shows the existence of significant qualitative differences in students' knowledge of how to identify chemical objects and the degree of skills formed to reveal the information embedded in chemical symbols.

**Keywords:** pedagogical experiment, semiotic approaches, semantic, pragmatic and syntactic approaches, chemical symbols, semiotic processes "coding" and "decoding".

**5. Vasileva –Tcankova, R.** Global Ecological Problems of Modern Society. *Acta Scientifica Naturalis*, Vol. 9, No 2, Pages 63-86, 2022, DOI: <https://doi.org/10.2478/asn-2022-0014>, Journal homepage: <https://content.sciendo.com/view/journals/asn/asn-overview.xml>

**Abstract:** At the modern stage of society's development, ecology is seen as a complex, interdisciplinary science of the relationships of organisms, society and the environment. Ecology is a science that studies the regularities of the life of organisms in their natural living environment and taking into account the changes made in this environment as a result of human activity. In recent years, the mass media has been constantly talking and writing about ecology, environmental problems related to anthropogenic activity. The person with his activity is heavily polluted and continues to negatively affect the environment at increasing rates. This reckless behavior of humans and the whole of society threatens planet Earth with imminent doom, no less than the use of nuclear weapons. Only from the positions of modern science ecology is it possible to develop issues related to the prudent use of the natural resources of the biosphere and the fight against changes brought about in nature by human activity in the age of the scientific and technical revolution. For this reason, it is necessary to seek information and a solution to the key current problems: What are the main pollutants of the atmosphere, hydrosphere and lithosphere? What is the origin of these substances? How does their impact affect life on Earth? What approaches and methods are needed to prevent environmental pollution?

**Keywords:** ecology, environmental problem, anthropogenic activity, environmental pollution, pollutant, atmosphere, hydrosphere, lithosphere, ozone layer, ozone hole, acid rains, greenhouse effect, radioactivity, desertification.

### III. Articles published in non-refereed peer-reviewed journals or published in edited collective volumes:

**1. Antonova, L., Vasileva-Tcankova, R.** Syntactic relations between signs in chemical symbolism and their relationship with the conceptual subsystems "substance" and "chemical reaction" in the 7th grade. "Bishop Konstantin

Preslavski" University Yearbook- Natural Sciences - Methodology, vol.XVI B3, "Bishop Konstantin Preslavski" University Publishing House, Shumen,2006, pp.53 - 62, ISSN 1311-834X.

**Abstract:** In the present work, the possibility of using a syntactic approach in the process of research and study of sign combinations in chemical symbolism is considered. On the basis of learning connections, different syntactic relations between the signs in chemical formulas and their relationship with the conceptual subsystem "substance" /"substance"/ are shown here. Based on the above, the possible combinations of signs in the composition of the chemical equation, which are symbols of the second system of "chemical reaction" concepts, have been clarified.

**Keywords:** syntactic approach, chemical symbolism, substance, chemical reaction.

**2. Vasileva-Tcankova, R.,** Antonova L. Use of a pragmatic approach in studying chemical reactions and the ways of their designation. "Bishop Konstantin Preslavski" University Yearbook - Natural Sciences - Methodology, p.XVI B3, "Bishop Konstantin Preslavski" University Publishing House, Shumen, 2006, c.63-75, ISSN 1311-834X.

**Abstract:** This paper examines some possibilities for planning and implementing a new research approach, discussing the specific types of chemical reactions and the ways of their designation - a pragmatic approach. The possible sign correlations studied by the General theory of signs, sign systems and sign processes (semiotics) are shown - "sign ~ object", "sign ~ person", "sign ~ sign" and the emphasis is placed on the ratio "sign (chemical formula) ~ person (student)", i.e. a pragmatic approach is used, from the point of view of semiotics, in teaching methods and in the teaching process.

**Keywords:** sign ~ person correlation, pragmatic approach.

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