



OPINION

Per. № 20/06.01.2025.

by competition for the academic position of "Associate Professor"

Field of higher education: 1. Pedagogical sciences

Professional field: 1.3. Pedagogy of education in..., scientific specialty

"Methodology of education in chemistry and environmental protection" - code 05.07.03 (SG, issue 70/20.08.2024) at the University "Prof. Dr. Asen Zlatarov" - Burgas.

Candidate: Senior Assistant Professor, Dr. Eng. Hristivelina Kostadinova Zhecheva

Author of the opinion: Assoc. Prof. Nadezhda Kaloyanova, PhD

(Order No. RD - 341 of 22.10.2024 of the Rector of the University "Prof. Dr. Asen Zlatarov")

1. Description of the competition procedure

In the announced competition for the academic position of "Associate Professor" in 1.3. Pedagogy of Education in..., scientific specialty "Methodology of Education in Chemistry and Environmental Protection" - code 05.07.03, for the needs of the Department of Chemistry at the Faculty of Natural Sciences, announced in the "State Gazette", issue 70 of August 20, 2024, one candidate participated: Senior Asst. Dr. Eng. Hristivelina Kostadinova Zhecheva.

The documents of Dr. Zhecheva, submitted for participation in the competition, show that the procedure for its disclosure and announcement has been complied with and they are in accordance with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, as well as with the Regulations on the terms and conditions for acquiring scientific degrees and for occupying academic positions at the University "Prof. Dr. Asen Zlatarov", Burgas.

2. Scientometric indicators

According to the Regulations on the conditions and procedure for acquiring scientific degrees and for occupying academic positions at the University "Prof. Dr. Asen Zlatarov", Burgas, the scientometric indicators of the candidate for occupying the academic position "associate professor" Senior Assistant Professor Dr. Eng. Hristivelina Zhecheva are the following:

The indicator from group "A" - 50 points, has been met.

The indicator from group "B" is not required for this position.

The indicator from group "B" - monograph presented as a habilitation thesis - 100 points, has been fulfilled.

Total number of points for indicator "G": 401.6, with 400 points required.

Total number of points for indicator "D": 100, with 100 points required.

Total number of points for indicator "E": 55, with 50 points required.

The scientific production presented by Dr. Eng. Hristivelina Zhecheva corresponds to the scientometrics set out in the Regulations on the conditions and procedure for acquiring scientific degrees and for occupying academic positions at the University "Prof. Dr. Asen Zlatarov", Burgas.



Main areas of the candidate's research work and most important scientific contributions

In the production presented by the candidate, two main areas of scientific interests are formed, namely - the chemical experiment as a method in teaching natural sciences in secondary school (with a focus on the subject "Chemistry and Environmental Protection") and improving the lesson as the main form of instruction in the same subject area.

Undoubtedly, the chosen topic is relevant and has a significant contribution to the development of the methodology of teaching natural sciences in secondary schools (in the field of chemistry and ecology). Within this topic, the candidate has conducted several theoretical and practical-applied research, which can be divided into two aspects.

The first aspect is the theory and methodology of the chemical experiment. In this aspect, methodological options for applying the ideas of constructivism, the competency-based and problem-based research approach to the formation of scientific literacy and key competencies of students have been developed and tested. Some aspects of the digitalization of natural science education, in particular Chemistry and environmental protection, have been described, and positive pedagogical experience from the preparation of student - future teachers in this subject has been derived. Alternative options for chemical experiments have been proposed, which significantly expands the possibilities for optimal choice by teachers according to resource provision. Classical and modern experiments have been proposed, consistent with the requirements for "green chemistry" and for reduced health and environmental risk. A plan for assessing the risk when conducting an educational chemical experiment has been drawn up, which is useful for chemistry teachers.

The second aspect concerns the design of chemistry and environmental protection education. In this aspect, a thorough theoretical review of several theories of educational design and specific models of educational design has been made, as a result of which a theoretical framework of educational design has been derived. Two general models of educational design have been specified – by R. Gagné and by M. Merrill, which have been adapted for specific pedagogical practice in Chemistry and Environmental Protection in the 10th grade. Design options for lessons in the same subject have been developed, consistent with the established traditions of the Bulgarian methodological school. Possibilities for adapting the theoretical framework to experimental study of chemical objects at university and at school, in real and virtual environments, have been described. The models have been tested in pedagogical practice.

In my opinion Dr. Zhecheva's scientific production has a practical and applied orientation. The main contributions are concentrated in two areas:

- Effective methodological approaches have been developed for planning, organizing and implementing experimental activities in Chemistry and Environmental Protection education in secondary school;
- Lesson design models for Chemistry and Environmental Protection in secondary school have been developed and implemented based on the specification and adaptation of two general educational design models, through which real methodological solutions are provided and help to improve the quality of science education.

The overall production of Dr. Eng. Zhecheva is indicative of her in-depth scientific research and practical and applied competence in the field of chemistry education methodology, which fully corresponds to the profile of the announced competition.



3. Critical notes, recommendations, questions

Although the theories of design for learning, which fit into the behavioral educational theory, are considered outdated, I accept that Dr. Eng. Zhecheva has adapted them competently and reasonably in the context of contemporary and established trends in Chemistry education. I also find her work on developing the methodology of the chemical experiment to be extensive, thorough and contributing. In this regard, the presented scientific production has a strong theoretical and applied justification in terms of specific methodological solutions in Chemistry education, but deficiencies in the methodology of scientific pedagogical research.

The methodological concept, or the chosen scientific-research approach for the implementation of the experimental work presented in the monograph, which is the main habilitation work for this competition, remains unclear. There is no clear description of the object, subject, goal and criteria for research, or a description of the methodological tools, the target groups, the approaches to analyzing the results, the stages of the experimental work.

On page 162 of the habilitation thesis, it is written: "The summative assessment is the final stage of the development of the model, the purpose of which is to formulate conclusions about its effectiveness. Based on the information received, a decision is made for the next wider implementation of the model or for replacement with another model. The results are evaluated regarding the mastery of intellectual skills (solving test tasks), problem-solving ability, quality and efficiency of thinking (solving a task through experimental research of the impact of a certain factor, etc.), acquisition of knowledge about facts, laws, theories (tests), practical skills (performing laboratory operations during experimentation), attitude (surveying). The results obtained aim to answer the question of how the tested model is better than others, to what extent the goals have been achieved and whether there are any unforeseen effects by comparatively considering two or more alternative solutions for educational design" (*end of quote*). However, the monograph only provides a general analysis and evaluation of the learning design models, without providing data and results confirming the feedback from students – as stated in the quote. The described tools for diagnosing and assessing students (test, survey) are not presented, resp. there are no developed indicators through which the effectiveness of solving tasks and problems during the activity (in this case, the lesson) is established. There is a lack of data from the conducted control studies (if any!). If there are none – it is surprisingly why they are stated as having been conducted.

On the other hand, in the presented author's reference it is written that the monograph contains "A purposeful experimental study was conducted on the effectiveness of two generally accepted models applied in a real process of teaching in chemistry with the participation of trainee teachers trained at the University "Prof. Dr. Assen Zlatarov" - Burgas. In this way, the students are included in scientific research activity, which supports their pedagogical preparation for practical application of their knowledge in the subject "Methodology and Technology of Scientific Research", studied in the 3rd ^{semester} of the specialty "Informatics and Information Technology in Chemicals and Chemical Education" (*end of quote*). It remains unclear as to which target group the study presented in the monograph was conducted - the students or the pupils?! What exactly was the purpose of the experiment - to develop professional competencies of future chemistry teachers or to approve and implement a model of design of chemistry education, through which to prove that this education has become more effective?!



In a number of publications, the same manner of work is noticeable, which does not correspond to the requirements for describing a scientific pedagogical experimental study.

I do not dispute the scientific research work of Dr. Zhecheva. As I noted, I find it thorough and competent. I recommend that Dr. Zhecheva refine her style of work according to the established standard for conducting and describing scientific pedagogical research. In this way, the results of her work will become more prestigious.

Another important remark I make to the articles and reports. It is noticeable that the same texts are present in different publications, without any interpretation within the specific topic of the publication. In some articles, the references are based on only 2 sources (and cited repeatedly in other publications), while others are overviews, repeating and compiling interpretative texts from other publications. It is good that these shortcomings are overcome in the future, as they diminish the otherwise well-founded methodological work of the candidate.

I recommend Dr. Zhecheva to expand the field of her research into other areas of chemistry and environmental education in searching of innovative solutions to ensure the transfer of students' knowledge and skills in real-life situations, as well as options for establishing interdisciplinary connections with other subject areas, which would lead to the development of students' transversal and personal skills.

- 1) **Which key competencies do you aim to develop in students through your proposed methodologies and lesson design models?**
- 2) **What professional competencies of future Chemistry and Environmental Protection teachers remain underdeveloped, and what improvements would you suggest for their university preparation?**

4. Conclusion

Based on the materials submitted for the competition, I believe that the candidate Senior Assistant Professor Dr. Eng. Hristivelina Kostadinova Zhecheva meets the criteria for occupying the academic position "Associate Professor", determined by the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Rules for its Implementation, as well as with the Regulations for the terms and conditions for acquiring scientific degrees and for holding academic positions at the University "Prof. Dr. Asen Zlatarov", Burgas.

I propose to the esteemed members of the Scientific Jury to vote positively and to propose to the Faculty Council of the Faculty of Natural Sciences at the University "Prof. Dr. Asen Zlatarov", Burgas, to elect Dr. Eng. Hristivelina Kostadinova Zhecheva to the academic position of "Associate Professor" in the professional field 1.3. Pedagogy of Education in..., scientific specialty "Methodology of Education in Chemistry and Environmental Protection".

Date: 3.1.2025

Burgas

Member of the scientific jury:

(Assoc. Prof. Dr. Nadezhda Kaloyanova)