

## REVIEW

by **Dr. Zhelyazka Dimitrova Raykova - Professor at the University of Plovdiv "Paisii Hilendarski"**

of the materials submitted for participation in the competition  
for the academic position of **'Associate Professor'**  
**at Plovdiv University "Paisii Hilendarski"**  
in the field of higher education 1. Pedagogical sciences  
Professional direction 1.3 Pedagogy of teaching in ...  
Scientific specialty Didactics of physics

In the competition for 'associate professor', announced in the *State Gazette, issue 40 from 14.05. 2021* and in the website of Plovdiv University "Paisii Hilendarski" for the needs of the *Department of Educational Technologies* at the *Faculty of Physics and Technology*, as a candidate participates **Ch. Assistant Professor Dr. Hristina Georgieva Petrova** from **Plovdiv University "Paisii Hilendarski"**.

### 1. General presentation of the received materials

By order № P33-№ 3129 of 12.07.2021 of the Rector of the University of Plovdiv "Paisii Hilendarski" (PU) I was appointed a member of the scientific jury of a competition for the academic position of **"associate professor"** in PU on field of higher education 1.3. *Pedagogy of teaching* in ..., professional field *Didactics of Physics*, announced for the needs of the *Department of Educational Technologies* of the *Faculty of Physics and Technology*.

**Only a candidate** has submitted documents for participation in the announced competition: *Ch. Assistant Professor Dr. Hristina Georgieva Petrova*.

The set of electronic materials presented by Hristina Petrova is in accordance with the Regulations for development of the academic staff of the University of Plovdiv, and includes the following documents:

- for research activity (set of scientific papers for participation in the competition)
- for educational activity (curricula, reference for classroom employment for the last 5 years, certificate for scientific guidance of graduates);
- documents regarding the professional realization and development of the candidate (diplomas, CVs, work experience, list of scientific papers, reference to the minimum national requirements for holding the academic position of "associate professor", list of citations, annotation of the attached materials and self-assessment of contributions).

The candidate *Hristina Georgieva Petrova* has described a total of 62 scientific papers: 1 monograph, 3 textbooks and teaching aids and a list of 58 research papers. A total of **37** scientific papers are accepted for review, of which 1 monograph, **33** scientific papers that are outside the dissertation, **3** textbooks and participation in **3** research projects. 12 scientific papers on the dissertation and 13 scientific papers outside the issues of the competition are not reviewed. Documents for participation in **2** national and **1** international projects are also presented. In the section "Educational activity" are provided official notes for classroom employment and a certificate for scientific guidance of graduates. The provided information provides comprehensive information about the personality of Hristina Petrova and her entire educational and scientific activity.

This information is documented and is a sufficient basis for building a correct opinion on the competition. The documentation is precisely systematized and meets the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria.

## **2. Brief biographical data of the candidate**

The only candidate for the competition, Dr. Petrova, was born in 1966. She graduated with a master's degree from the Faculty of Chemistry and Biology of Plovdiv University "Paisii Hilendarski", majoring in "Chemistry and Physics" in 1990. For two years she was a lecturer at the Dicho Petrov Pedagogical Institute, Smolyan, and since 1996 she has been an assistant professor and chief assistant at the Department of Physics Teaching Methodology (now Educational Technologies) at the Faculty of Physics (now Faculty of Physics and Technology) of the University of Plovdiv. She has been a doctor of physics teaching methodology since 2012. The topic of her dissertation is "Using the graphic method in teaching physics in high school (section Kinematics and Thermodynamics).

Dr. Petrova develops and conducts lectures and exercises in **7** disciplines in the field of physics and the methodology of teaching physics - general electrical engineering, applied physics, ICT and work in a digital environment, methodology and techniques of teaching experience, theory and methodology of the didactic test, the graphic method in teaching and methodology of teaching physics. For 25 years he has been actively organizing and conducting the training in pedagogical practice (hospitality, current pedagogical practice and undergraduate pedagogical practice) of students, future teachers of physics and astronomy.

The professional experience of the candidate related to the announced competition is impressive, which is a reason for a positive assessment.

## **3. General characteristics of the candidate's activity**

### **Assessment of educational and pedagogical activity and preparation of the candidate**

Dr. Hristina Petrova has extensive pedagogical experience and many years of teaching experience at the Plovdiv University "Paisii Hilendarski". According to the submitted documents, the required study load is present, as well as for her participation in the announced competition, the candidate has submitted a reference from the Faculty of Physics and Technology of the PU "Paisii Hilendarski". Its study load in the last five years is on average 500 hours, which is an indicator of overfulfillment of the mandatory standard of study commitment.

The following facts testify to the high quality of the candidate's teaching activity:

- She has developed author's lecture courses in the specialties of Bachelor's and Master's degrees - Methodology of teaching physics, Methodology and technique of the school experiment in physics, General Electrical Engineering, Theory and methodology of the didactic test, ICT and work in a digital environment, Applied Physics, The Graphic Method in Physics Education.
- She is the author of 10 curricula for students from several faculties of the university.
- Participant as a member of the team in 2 international and 2 national educational and research projects.

- Supervisor of a total of 7 successfully defended graduates of bachelor's and master's degrees.

She is a member of the Union of Scientists in Bulgaria and the Union of Physicists in Bulgaria, Plovdiv.

The high assessment of the educational and pedagogical activity and the professional preparation of the candidate for the position of "associate professor" can be justified by her professional commitment and her competent attitude to work with students, future teachers of physics. Her work with teachers of physics and astronomy expands the scope of the teaching and pedagogical activities of the candidate and confirms her professional opportunities in terms of science and the professional direction of the competition.

### **Evaluation of the scientific and scientific-applied activity of the candidate**

The general characteristic of the research and scientific-applied activity of Dr. Petrova is positive. The candidate in the competition is the author of many significant scientific papers in the field of methodology of teaching physics. In the announced competition she applied with 37 scientific papers: 1 monograph, 3 textbooks, 7 articles in scientific journals included in the world system for reviewing, indexing and evaluation with impact rank and impact factor, 20 articles in refereed journals and scientific papers and 6 reports from scientific conferences.

A valuable work for the methodology of teaching physics is the presented monograph "Graphic modeling in teaching physics", University Publishing House "Paisii Hilendarski", 2021., ISBN 978-619-202-652-3. The monograph examines questions about the state and some trends related to graphic modeling in physics education. Emphasis is placed on didactic-applied aspects of some graphic models and the place of certain techniques for graphic modeling and their implementation in contemporary physics education in Bulgarian secondary education is highlighted. The text presents ideas for the development and improvement of graphic skills in the study of different physical sections. In this sense, the topic developed by the author has a high scientific value - both theoreticly and in terms of application.

In general, the monograph wins with its positive features and contributions, which can be summarized as follows:

- Significance and relevance of the problem developed in the work.
- An achievement of the author is the objective presentation of the new opportunities for enrichment of the theory and practice of teaching physics, by studying the didactic potential of the graphic method in teaching physics.

The presentation of this topic in the book is consistent with the study of high school physics in modern conditions.

The most important accents in the books and textbooks presented by Dr. Petrova are again related to the graphic method and have a strong practical focus. These are a collection of graphical problems with proposed algorithms for solving (*Petrova Hr. (2014). Collection of graphical problems in physics for secondary schools section "Thermal Phenomena". University Publishing House "P. Hilendarski". ISBN 978-954-423 -915-2*) and two methodical manuals for teaching the sections Kinematics, Dynamics, Statics and Thermodynamics in the eighth grade of the Bulgarian school with a predominant graphic method (*Petrova Hr. (2015).*

*Methodical manual for teaching with a graphic method of "Kinematics" and Thermal Phenomena in the Eighth Grade, P. Hilendarski University Press, ISBN 978-619-202-035-4, Petrova Hrva (2016), Methodological Guide for Applying the Graphic Method in the Study of Dynamics and Statics in Secondary school, P. Hilendarski University Publishing House ISBN 978-619-202-152-8).*

The presented research in scientific articles and reports can be divided into two thematic blocks:

a) The didactic theory of graphic modeling and in particular of its interpretation and application in physics education has been enriched. Almost half of the candidate's publications are related to this topic (Publications № 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 27, 33). This is an indicator of consistent scientific interest and the desire for in-depth study of selected issues.

b) Research has been conducted on some current trends in the methodology of physics education related to the application of a reflective approach (Publication № 29), scientific literacy (Publication №17, 31), distance learning physics in an electronic environment (Publications №24 , 26 and 28), formation of key competencies and meta-subject universal skills (Publications № 13 and 14). The researches of the author and the shared ideas in the presented works enrich the pedagogical science in relation to the adaptation of the mentioned current tendencies to the teaching of physics in the Bulgarian school.

I evaluate the scientific and scientific-applied production of the candidate as up-to-date, high-quality and useful, which outlines the development of the methodology of teaching physics and is of interest to the professional community.

### **Main scientific and applied contributions and citations**

The general characteristics of the research and applied research activities of Hristina Petrova is positive. The original scientific contributions of the candidate are related to the solution of the pedagogical problems related to the research and development of the applications of the graphic method in the teaching of physics.

#### *A. Theoretical contributions*

- A complex analysis of the graphic method and its adaptation in school education in physics was performed. This analysis includes a review and description of the didactic possibilities of the graphic method in the context of visualization and modeling in physics education.

- A theoretical study was made to specify the application of graphic modeling in different types of physics lessons and for different sections of school content.

- Some modern trends in didactics related to reflection, competence approach and science literacy in physics education are studied.

#### *B. Scientific and applied contributions*

- Specific solutions for the application of the graphic method in the teaching of physics in high school in different forms are proposed.

- A model for the formation and development of graphic skills in the study of the main sections of the school course in physics has been developed.
- Textbooks have been created that support the academic training of future physics teachers and contribute to raising the professional qualification of current teachers.

In general, the candidate enriches and further develops the theory and practice in the field of methodology of teaching physics by presenting a complex methodological approach for adaptation and application of the graphic method in the teaching process of physics in high school in order to increase its effectiveness.

In support of this overall assessment of scientific contributions, we can point to the fact that the works of Dr. Petrova have been cited as significant and cited in a number of publications - dissertations, textbooks, articles and textbooks. A list of 19 citations is presented and 6 are attached to the competition.

#### **4. Assessment of the personal contribution of the candidate**

The significance of the scientific and scientific-applied contributions of the presented works of the candidate for the competition for "Associate Professor" Dr. Hristina Petrova is indisputable. The monograph "Graphic Modeling in Physics Education" is a serious study that has a high scientific value - both theoretically and scientifically applied.

The presented report on the implementation of the minimum national requirements for holding the academic position of "Associate Professor" shows that the candidate fully meets the requirements for the various groups of indicators. The review of the reliability of the presented data and evidence convinces me of their truthfulness and correctness.

#### **5. Critical remarks and recommendations**

The following recommendations can be addressed to the research and teaching activity of the candidate:

- The fact that most publications are standalone makes a good impression. However, I think it is good for Dr. Petrova to include students and teachers in her future research.
- It is recommended that Dr. Petrova focus her research efforts on exploring the possibilities of modern technologies related to mobile devices and cloud technologies for targeted formation of graphic skills in the study of physics in Bulgarian schools.

#### **6. Personal impressions**

I have been working with Dr. Petrova in one department since she started working in 1996. I can rightly say that she is a disciplined and purposeful researcher, a loyal and respected colleague. She is a beloved teacher following the modern trends in education, striving for high quality methodological training of future physics teachers. Her scientific activity is known and well received by the college at the university and in the country.

#### **CONCLUSION**

The documents and materials submitted by **Ch. Assistant Professor Dr. Hristina Georgieva Petrova meet all the requirements** of the Law for the Development of the

Academic Staff in the Republic of Bulgaria rya (ZRASRB), the Regulations for application of ZRASRB and the respective Regulations of PU "Paisii Hilendarski".

The candidate in the competition has submitted **a sufficient number** of scientific papers, published after the materials used in the defense of ONS "Doctor". In the works of the candidate there are original scientific and applied contributions, which have received international recognition as a representative part of them are published in journals and scientific collections published by international academic publishers. Her theoretical developments have practical applicability, as some of them are directly oriented to the educational work. The scientific and teaching qualification of *Dr. Hristina Georgieva Petrova* is **undoubted**.

The results achieved by Dr. Hristina Georgieva Petrova in the teaching and research activities fully comply with the specific requirements of the Faculty of Physics and Technology, adopted in connection with the Regulations of the University of Plovdiv for the application of ZRASRB.

After getting acquainted with the materials and scientific papers presented in the competition, analysis of their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my **positive conclusion** and recommend to the Scientific Jury to prepare a report-proposal. to the Faculty Council of the Faculty of Physics and Technology for election of Dr. Hristina Georgieva Petrova to the academic position of "Associate Professor" at the University of Plovdiv "P. Hilendarski" by professional field 1.3. Pedagogy of teaching ... (Didactics of physics).

07.09.2021

Plovdiv

Reviewer: .....

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