

REVIEW

**from PhD Neli Ivanova Dimitrova – associate professor
in University of Sofia „Saint Kliment Ohridski“**

(scientific degree, first, middle and last name– academic position in scientific organization)

of the materials presented for participation in competition
for filling an academic position „**associate professor**“
in University of Plovdiv „Paisii Hilendarski“

by Field of higher education 1. Pedagogical sciences
Professional direction 1.3 Pedagogy of teaching ...
(Scientific specialty Methodology of teaching Physics)

In the competition for associate professor/ professor, announced in National newspaper, copy 40 from 14th May 2021 and in the web page of University of Plovdiv „Paisii Hilendarski“ for the needs of the Department „*Educational technologies*“ to Faculty of Physics and Technology, **Hristina Georgieva Petrova** from University of Plovdiv „Paisii Hilendarski“ participates as a candidate.

1. General presenting of the received materials

With order № P33-3129 from 12th July 2021 of the Rector of University of Plovdiv „Paisii Hilendarski“ (PU) I am determined for member of the scientific jury in competition for taking an academic position „**associate professor**“ **in PU** by Field of higher education 1. Pedagogical sciences, Professional direction 1.3 Pedagogy of teaching ... , (Scientific specialty Methodology of teaching Physics) **announced for the needs of** the department „*Educational technologies*“ to Faculty of Physics and Technology.

For participation in the announced competition **one candidate** has handed over documents:
chief assistant PhD Hristina Georgieva Petrova
(academic position, scientific degree, first, middle and last name from scientific organization)

Set of materials on electronic carrier, presented by Hristina Georgieva Petrova, is in correspondence with Regulations for development of the academic staff of PU and includes the following documents:

- ✓ For scientific and research activity (set of scientific works for participation in the competition)
- ✓ For educational activity (educational programs, verification for auditorium workload for the last 5 years, certificate for scientific guidance of graduates)
- ✓ Demanded and applied documents about professional realization and candidate's development (diplomas, autobiographical data, work experience, list with scientific works, verification for minimal national requirements for taking the academic position „associate professor“, list with citations, annotation of the applied materials and self-evaluation of the contributions).

Candidate Hristina Georgieva Petrova has described 62 scientific works: 1 monography, 3 educational appliances and list of 58 scientific and research developments. **37** scientific works, 1 is a monography, 33 are scientific works out of the dissertation and are taken into account in the final evaluation, 3 are educational appliances and participation in 3 scientific and research projects

are accepted for reviewing. 12 scientific works on the dissertation and 13 scientific works out of the competition's problems are not reviewed. The distribution of the scientific works by related rubrics, in our country and abroad is: 1 monography, 3 educational appliances, 27 publications in reviewed and indexed journals in Bulgaria and abroad and 6 participation in conferences (national and with international participation) on questions of physics education with reports. Documents (official notes) for participation in 2 national and 1 international projects are also presented.

In part Educational activity certificates for auditorium workload and for scientific leadership of graduates are given up.

All the information gives comprehensive information about Hristina Petrova as a personality and her complete educational and scientific activity. This information is documented and is enough base to construct a correct standpoint on the competition. The documentation corresponds to the requirements of the Law for developing of the academic staff in Republic Bulgaria.

2. Short biographical information (of the candidate)

Chief assistant PhD Hristina Petrova is a lecturer in University of Plovdiv „Paisii Hilendarski“, Faculty of Physics and Technology.

She finished higher education excellently in 1990 in PU „Paisii Hilendarski“, Faculty of chemistry and biology, specialty Chemistry and Physics, educational qualification degree „Master“, professional qualification Teacher of chemistry, Teacher of physics. Her professional development and education

continues as following:

1992-1993 – after-diploma specialization on Methodology of chemistry, Department Methodology of chemistry education, PU „Paisii Hilendarski“

1998 – specialization on didactics of physics, chemistry and biology, Faculty of agronomical sciences, Jembloux, Belgium

2008-2011 – PhD studies, field of higher education 1. Pedagogical sciences, professional direction 1.3 Pedagogy of teaching physics

2012 – PhD on Methodology of physics education. Dissertation on topic „Use of the graphical method in physics education in secondary school (sections Kinematics and Thermal phenomena)“

Work experience and occupied positions by PhD Hristina Petrova are in the sphere of higher education:

1993-1995 – assistant in Pedagogical institute „D. Petrov“, Smolyan, Department Mathematics, Physics and Informatics

1996-2021 and now – chief assistant in PU „Paisii Hilendarski“, Faculty of Physics and Technology, Department Educational technologies, she has taken consecutively academic positions assistant, senior assistant and chief assistant

Totally 28 years of work experience.

Main activities: pedagogical activity in the directions of higher education; scientific activity in the direction Methodology of physics education, participation in projects

Competences and skills: she has an excellent command of English and Russian, French on a very good level. She has communication and presentation skills, skills of teamwork and interpersonal communication. She uses the necessary computer programs for her professional activity and she also applies technical skills for working in physics laboratory. She participates in important educational projects on European and national level by programs Comenius, Science and education for intellectual growth and others (totally 4 according to the CV- 2 international and 2 national projects).

3. General characteristics of the candidate's activity

PhD Hristina Petrova develops lectures and conducts courses, seminars and workshops for students from the Faculty of Physics and Technology, Faculty of Chemistry, Faculty of Biology, Faculty of Pedagogy and Faculty of Philosophy and History of Plovdiv University "Paisii Hilendarski". They are aimed at both private and didactic aspects of the methodology of teaching

physics, such as: methodology of the Physics training experiment; graphical method in teaching physics, etc., as well as on general didactic topics such as theory and methodology of the didactic test; information and communication technologies and work in a digital environment; audio and visual

information technologies in education; presentation and communication skills.

The teaching practice of PhD Petrova in courses aimed at developing skills in basic disciplines such as Electrical Engineering and Applied Physics is also impressive.

And, last but not least, PhD Hristina Petrova organizes and manages the pedagogical practice of students from the Faculty of Physics and Technology, the Faculty of Chemistry and the Faculty of Biology of the University of Plovdiv.

From the presented documentation it can be seen that PhD Petrova is the titular of 12 courses, for which she has created the relevant curriculums. The disciplines are focused mainly on the methodology of teaching physics in the field of higher education and postgraduate qualification of physics teachers. Thematic focus of the programs is on the formation of significant skills in students, related to the use of methods of scientific knowledge, visual and practical methods of training and assessment of achievements in secondary school, use of computer technology for visualization and training in a digital environment. Dr. Petrova creates and conducts courses in basic disciplines such as Electrical Engineering.

Chief Assistant PhD Hristina Petrova was the scientific supervisor of 7 successfully defended graduates - 4 from the bachelor's degree in Physics and Mathematics and 3 from the master's program Physics Teacher.

The presented verification on auditorium workload for the last 5 school years shows overfulfillment of the required educational standard. From the reviewed materials for the competition it can be summarized that PhD Hristina Petrova responsibly and consistently performs her functions as a lecturer in various forms and topics of education of students from different faculties of PU "Paisii Hilendarski".

PhD Hristina Petrova is a member of the Union of Scientists in Bulgaria and of the Union of Physicists in Bulgaria, Plovdiv.

Chief assistant PhD Petrova participates with **37 publications** in the competition for associate professor:

- ✓ Monographies 1
- ✓ Educational appliances 3
- ✓ Publications in scientific journals, included in the world system for referring, indexing and evaluation with Impact rank (SJR) and Impact factor 7
- ✓ Publications in referred and indexed journals abroad 2
- ✓ Publications in referred and indexed Bulgarian journals and scientific works 18
- ✓ Publications in national conferences, published in full text 5
- ✓ Publications in scientific conferences with international participation 1

Of the 37 scientific works participating in the competition, 35 are independent and 2 are co-authored 1 with one co-author and 1 with two co-authors. 34 of the scientific works were published after the year of defense of the doctoral dissertation.

The scientific contributions in the author's reference are divided into the following directions:

1. Innovative educational technologies
2. Graphical modeling in Physics education
3. Information and communication technologies in education
4. Content, methodology and techniques of the Physics training experiment
5. Use of the reflexive approach in Physics education
6. Forming of meta-objective universal skills among students

The contributions could be summarized in **two directions** after studying the publications: **methodology of teaching physics**, including scientific developments in the areas indicated by the candidate 1, 2, 3 and 4 directions and **didactics**, uniting around the indicated 1, 3, 5 and 6 directions.

The presence of practical-applied and scientific and research orientation is ascertained in the scientific works. The author's reference with annotations of the materials (file 7.1) shows the specific

contributions of each publication, submitted for the competition, which are accepted by the reviewer. All presented publications are in the field of the professional direction, in which the competition was announced, within the object and the subject of science „Methodology of teaching physics“.

About 90% of the submitted scientific works for the competition participate in the **first** direction. Petrova's research includes theoretical research, methodological guidelines, technological solutions and didactic resources.

- The types of graphical problems in physics are systematized and on the basis of this algorithms for their solution are created. They are specified for certain sections of physics (articles 1, 10, 12, 18, 33). Methodological guidelines have been made for physics teachers in this context (article 2).
- Practical guidelines for the use of training experiment in the teaching of Man and nature in the junior secondary school stage and Physics and astronomy in the course of study in the secondary school; lesson structures using a graphical method of teaching, graphical modeling, solving graphical problems; use of physics training experiment in secondary and high school have been created (articles 3, 4, 8, 9, 15, 17, 20, 21, 25, 26, 30, 32, 33). Articles 8 and 9, which have been published in reviewed and indexed journals abroad, have contributed to the development of three new methods for experimental verification of Bernoulli's law, which are different from the standard tube with different cross-sections (article 9), and a new way of demonstrating capillary effects using a conical capillary tube of variable cross-section (article 8).
- Methodological guidelines related to planning, organization, conducting the process of teaching Physics and astronomy through the graphical method of training (methodical manuals) have been created.
- A technology for solving graphical problems in physics education has been developed (article 2), which has not been published or described in the methodological literature so far.
- One book with graphical tasks for the secondary school from the curriculum in Physics and astronomy, section "Thermal phenomena" has been developed. The main contribution is in the variability of the use of the graphical teaching method.
- One methodical manual both for students - future teachers, and for practicing teachers with methodical elaborations of lessons from the sections "Thermal Phenomena" and "Kinematics" has been developed.
- One educational appliance with methodological guidelines and graphical tasks for the sections Dynamics and Statics has been developed. It is important to note the inclusion of modern computer programs for graphical modeling of physics objects, processes and phenomena.
- The monography "Graphical Modeling in Physics Education" theoretically summarizes the research of number of authors, as well as PhD Petrova in the field of educational modeling and in particular graphical modeling. Structural models of basic graphical skills have been developed: for plotting graphs and for extracting information from constructed graphs. They are the basis of the structure of the activity of the teacher and the student in the formation of graphical knowledge and skills. PhD Petrova's contributions are based on her abilities to systematize and summarize scientific information on the problem, to select, adapt and create

appropriate didactic resources (graphical tasks, experimental tasks, etc.) for mastering key competencies, practical and intellectual skills in students. They are also based on the presented technologies for teaching through graphical modeling for selected topics in physics, as well as in modern enrichment of the researched scientific method of knowledge through computer modeling.

In the **second** direction, theoretical and empirical research was conducted as a study of the attitude of practicing teachers to the implementation of pedagogical communication in an electronic environment (article 28) in order to prepare didactic resources for the preparation of students - future teachers. Conceptual ideas and methodological guidelines for mastering key competencies through a competency approach (article 13); formation of meta-subject universal skills in students from

primary to secondary school (article 14); activation of cognitive activity and formation of meta-subject skills in students through a reflective approach (article 29) are presented.

Requirements are presented and methodological guidelines are proposed related to the development, implementation and assessment of the educational computer presentation (article 6) and the new functions of the teacher in training with information and communication technologies (article 7).

I think that based on the findings made in this way, PhD Petrova has thoroughly, in detail and creatively studied the methodological problem of graphical modeling and its possibilities for use in the educational process in physics. The field of her scientific interests is expanded by the theoretical and applied research in the field of general didactics and indicated in direction 2.

I accept the scientific developments presented for the competition entirely for personal work of PhD Petrova.

I see the impact of the scientific works of PhD Hristina Petrova in the usefulness and help to provide future and current teachers of natural sciences for understanding, use and reflective approach in the implementation of the educational process through graphical modeling, solving graphic problems, conducting a training physics experiment, integration of information and communication technologies in the teaching of natural sciences.

From the presented list of citations - a total of 19 in number PhD Hristina Petrova has selected for the competition 4 cited articles (file 6. Verification NACID, criterion D) - articles 3, 6, 8 and 9 which are published in national and international scientific journals included in the global system for referencing, indexing and evaluation with impact rank and impact factor. Two of the articles are co-authored and 2 are independent. The number of citations presented for competition is 6. The citations are in international scientific journals included in the global system for reviewing, indexing and grading with impact rank and impact factor. These citations carry 90 points, which exceeds the required minimum of 50 points according to the national requirements for holding the position of „associate professor“.

When reviewing the other citations, I find that citations for a total of 7 articles and one methodological guide from the scientific production of PhD Hristina Petrova, and in addition to internationally recognized scientific journals and university yearbook of scientific works are cited in the dissertation. These facts show continuity and recognition of the scientific works of PhD Hristina Petrova among the scientific circles at home and abroad.

4. Assessment of the personal contribution of the candidate (s)

Some of the personal contributions of PhD Hristina Petrova were highlighted in the relevant places in the review. From the examined documents and publications the standpoint is formed clearly and convincingly that she has a markedly active teaching and scientific activity.

She has carried out a number of theoretical and applied research in the field of methodology of teaching physics. She has developed a wide range of didactic resources for physics education in secondary school and university. She has been a research supervisor of diploma theses in bachelor's

and master's programs. The curricula developed by her are aimed at mastering various and important professional skills of students - future teachers.

My summary assessment of the overall teaching, research and applied research activities of chief assistant PhD Hristina Petrova is emphatically **positive**.

5. Critical remarks and recommendations

I have no remarks regarding the election of PhD Hristina Petrova as an associate professor. All materials for the competition are carefully prepared and documented.

A great scientific production in the field of Methodology of Physics education is presented. It has mainly theoretical and applied character and as a prospect it can be done a conduction of empirical research in higher and secondary school of the created author's didactic algorithms, methodological models of lessons, didactic technologies, didactic resources and etc. to check their effectiveness for the educational process in physics.

6. Personal impressions

PhD Hristina Petrova and I have participated together in national conferences on physics education. I can share from my communication with her and from the observation of her performances that I formed an image of PhD Petrova as a very good teacher, good organizer, responsible professional and capable scientist and she can carry with honor the title of "Associate Professor" of Plovdiv University.

CONCLUSION

The candidacy of chief assistant PhD Hristina Petrova, her scientific and teaching contributions, presented through the publications and her teaching profile, correspond to the field and the professional direction, which testifies that she can be elected as an associate professor in the announced competition.

The documents and materials submitted by PhD Hristina Georgieva Petrova **meet all the requirements** of the Law on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for implementation of the Law on the Development of Academic Staff in the Republic of Bulgaria and the relevant Regulations of PU „Paisii Hilendarski“.

The candidate in the competition has submitted a **sufficient** number of scientific works published after the materials used in the defense Educational and Scientific Degree ‘PhD’. In the works of the candidate there are original scientific and applied contributions, which have received international recognition and most of them are published in journals, published by international and national academic publishers. Her theoretical developments have practical applicability and most of them are directly oriented to the educational work.

The results achieved by PhD Hristina Georgieva Petrova in the teaching and research activities **fully** comply with the specific requirements of the Faculty of Physics and Technology of PU „Paisii Hilendarski“, adopted in connection with the Rules of Plovdiv University for application of Law on the Development of Academic Staff in the Republic of Bulgaria.

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

12th August, 2021

Reviewer:
/Assoc. Prof. PhD Neli Dimitrova/