

REPORT

Regarding the competition for holding the higher academic post of Associate Professor in Higher Education Area 1. Pedagogical Sciences, Professional Field 1.3. Pedagogy of Teaching in (Mathematics), announced in the State Gazette, issue 87 of 19.10.2021.

Applicant (an only applicant): **Chief Assistant Irina Zdravkova Vutova, PhD.**

Member of the Scientific Jury: **Prof. Petar Dikov Petrov, PhD,**

Sofia University St. Kliment Ohridski ,

Order № RD – 38-592 of 10.12.2021 by Rector of Sofia University
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I. General description of the submitted materials

1. Competition data

To participate in the competition, the applicant has submitted a list of 19 titles of publications: one single-authored monograph, presented as a habilitation thesis, one single-authored monograph, published and not presented as a major habilitation thesis, five articles published in scientific journals, refereed and indexed in world-famous scientific databases like the Journal of Mathematics and Informatics, nine articles and reports published in both non-refereed journals with scientific editing and in peer reviewed collective volumes as well as three research studies published in scientific journals and indexed in world-famous academic research databases.

The presented publications are cited as follows: two citations in scientific journals, refereed and indexed in world-famous scientific databases (Mathematics and Informatics), six citations in monographs and peer reviewed collective volumes of scientific papers, two citations in non-refereed scientific journals. The applicant scientific output is structured correctly by separate groups according to the *minimum national requirements for holding the doctoral degree and the academic post of Associate Professor*, as follows: a total number of points for B group and its indicators - 150; a total number of points for D group and its indicators – 254,53; a total number of points for E group and its indicators - 100.

Considering the documents presented for the competition by Chief Assistant Irina Vutova, PhD, it has been found out that they fully comply with the requirements of Law on Academic Staff Development In The Republic of Bulgaria, the Regulations for applying the Law on Academic Staff Development In The Republic of Bulgaria and the Rules On The Conditions And Procedure For Acquiring Science Degrees And Holding Academic Positions at Sofia University "St. Kliment Ohridski". The presented by the applicant report shows that the minimum national requirements under Art. 2b of the Law on Academic Staff Development In The Republic of Bulgaria for the scientific field of Pedagogical Sciences, 1.3. Pedagogy of Teaching in (Mathematics) to hold the academic position of Associate Professor have been fulfilled. Moreover, the number of points exceed the required ones in all indicators. It could be concluded that the developed by Ch. Assistant Professor Dr. Vutova issues are dedicated to the most currently discussed ones in this field.

2. Applicant Data

I am very impressed by the 'life path' and the professional development of Chief Assistant Irina Vutova, PhD. She first graduated from the High School of Natural Sciences and Mathematics and at the same time the High School of Languages (with English), and then she earned Master's degree in Business Administration, Bulgaria, as well as in Economics and Management at Erasmus University, Faculty of Economic Sciences, Rotterdam, The Netherlands. From 1998 to 2005 she was a part-time assistant at the Department of Geometry in the Faculty of Mathematics and Informatics at Sofia University "St. Kl. Ohridski". For several years she had been a teacher in Mathematics at the Spanish Language High School and at the French Language High School in Sofia. In 2005 she became a full-time assistant at the Department of Teaching Mathematics and Informatics at the Faculty of Mathematics and Informatics at Sofia University "St. Kl. Ohridski", and for many years she also continued teaching students at high schools.

In 2014 she defended her doctoral thesis in the professional field 1.3. Pedagogy of Teaching ... (Methods of Teaching Mathematics) at the Faculty of Mathematics and Informatics on the topic: Heuristic And Prognostic Role Of Theorems In School Mathematics.

The candidate was a leader of an international research project, "Research in the field of current educational monitoring", under the Tempus Programme 10 funded by Scientific Research Fund of Sofia University, 2016. She was on working visits to foreign universities like University of Belgrade and University of Joensuu, Finland. So far she has published 4 books, 3 monographs, 3 research studies and 13 articles in scientific journals, 18 articles in conference proceedings and 5 textbooks. She speaks English and Russian. While working on national and international projects, she has developed teamwork skills

for academic and professional success. In summary, all this can be described by the English word "upgrading"!

3. General characteristics of the applicant scientific output and achievements

As is generally known, in the last two decades of the XXI century there has been an intensive development of classical pedagogy. Subjected to modernization, it has gradually turned from a predominantly empirical to a system-theoretical science. The research approach, the competence approach, the synergetic approach, the activity-personal approach, etc. are finding more and more wide application in the general didactics and in the private didactics, reasonably and eventually turning into pedagogies of education.

In my latest article of 2021, I assert the notion that the so-called general (school) didactics and the so-called Methods of teaching in subjects have become relatively independent sciences, closely related to each other and mutually enriching. In particular, I point out to Prof. V. Nenkov's publications on increasing mathematical competencies, Dr. St. Stefanov's on the research approach in teaching mathematics, paying special attention to the monograph of Chief Assistant Dr Vutova's "Theorems, analogy, heuristics or theorem - hypothesis - theorem prim". My assessment on this monograph is that it makes a very successful attempt to apply the research approach in teaching mathematics. Considering the relationship between deduction and heuristics in mathematics education, the author rightly points out that ... "the concept of heuristics in the methods of teaching mathematics is considered in two directions, which are not mutually exclusive. The first one, heuristics, is associated mainly with the activity of solving a problem, and the second one is associated mainly with the activity of discovery, construction of new knowledge (p. 31). It focuses mainly on the second direction and in particular on heuristics in formulating hypotheses and constructing new (for the school and the academic students) theorems in mathematics education.

The research approach also finds a place in her articles (co-authored) related to mathematics education and elementary school. The article *Euler and Venn diagrams or MZ-maps in primary school mathematics* provides a complete comparative analysis of two methodological approaches (classical and innovative) for modelling and solving problems of additive operations with "overlapping" sets and natural numbers (p. 143). In the article *Two approaches to the study of equations in primary school mathematics* the authors (one of whom is Dr. Vutova) introduce the concept of arithmetic equation and make a mathematical and methodological parallel between the traditional method of the unknown component and the method of arithmetic transformations (inversion) to solve problems in primary school mathematics (p. 502). In the article *Arithmetic or algebraic method for solving problems in primary school mathematics*, the authors (one of whom is Dr. Vutova) outline the upper limits of arithmetic methods for solving problems in primary school mathematics and answer the question when the algebraic approach turns out to be

inevitable or logically justified. Based on their method of mathematical maps, they have discovered a criterion (called an "arithmetic node") to meet the necessity to construct an algebraic model for solving a problem (p. 11).

4. Characteristic features and evaluation of the applicant teaching activity

During the period from 1998 to 2021, the candidate Irina Vutova worked as a part-time assistant professor, senior assistant professor, chief assistant professor, earned the doctoral academic degree and gained rich educational experience.

5. Content analysis of the applicant scientific and research applied contributions presented in the competition participation materials

The publications of Chief Assistant Professor Irina Vutova, PhD are related to the educational work of teachers in mathematics and to university mathematics for training future-to-be teachers in mathematics. The scientific and applied contributions of the works submitted for the competition are in the field of theory and practice of teaching geometry, primary school mathematics, entertaining mathematics and history of mathematics. The possibility of vector-algebraic modelling both for solving problems and for "expanding" geometric knowledge by constructing analogues of planimetric theorems in spaces with three or more dimensions is shown. For the purposes of mathematical preparation of students, future-to-be teachers in mathematics for primary grades, a modern concept for university education in mathematics has been developed, in which knowledge is not taught but recreated and a new form of teaching is proposed, called by the authors "academic lesson". A new form for analysis and visualization of a textual arithmetic problem is proposed by constructing a mathematical map of the problem, which turns out to be a technological model of the latter. In the materials for the competition the contributions of the applicant scientific output are described and systematized in 10 items. I accept as objective the scientific and research applied contributions, which Chief Assistant Professor Irina Vutova, PhD, has formulated. All scientific and research applied contributions are the work of the candidate. I can firmly say that Irina *has been actively involved in the development of the didactics of mathematics as a relatively independent field*.

6. Critical remarks and recommendations

I have no significant remarks regarding her scientific output. My recommendation is to continue in the future with research in the field of didactics of mathematics.

7. Personal impressions of the candidate

I do not know the candidate and I have no personal impressions of her.

8. Conclusion on the application

Based on the analysis of the overall scientific and research applied output, the pronounced quality of innovation, I will vote positively, inviting all other members of the Scientific Jury to vote in favour of Chief Assistant Professor Irina Zdravkova Vutova, PhD, to hold the academic post of Associate Professor.

II. GENERAL CONCLUSION

I am fully convinced that the esteemed members of the Scientific Jury must propose to the members of the Faculty Council of Faculty of Mathematics and Informatics that Chief Assistant Professor Irina Zdravkova Vutova, PhD, be elected to the academic position of Associate Professor in the field of higher education 1. Pedagogical Sciences, Professional field 1.3. Pedagogy of Teaching in ... (Mathematics).

**Member of the Scientific Jury:
(Prof. Peter Petrov, PhD/**