

## REVIEW

**By:** Prof. Adriana Lubomirova Tafrova-Grigorova, PhD (University of Sofia, Professional field 1.3. Pedagogy of Teaching ... (Methodology of Teaching Chemistry), Member of the Scientific Jury, appointed with an Order of the Rector of the University of Plovdiv No. 33-3163 from 13.07.2021

**Related to:** A competition for an academic position “Reader\*” (Associate Professor, Docent) open at the Faculty of Chemistry at University of Plovdiv, Field of higher education 1. Pedagogical Sciences, Professional field 1.3. Pedagogy of Teaching ... (Methodology of Teaching Chemistry)

A candidate for one of the two positions of Reader (Associate Professor) in Pedagogy of Teaching ... (Methodology of Teaching Chemistry), announced in State Gazette No. 40/14.05.2021 is Dr. Antoaneta Anastasova Angelacheva.

The candidate has submitted a set of documents containing:

### **I. Administrative documents**

- I.1. Application for the competition
- I.2. Curriculum Vitae (CV)
- I.3. Higher education master degree diploma and annex thereto
- I.4. Diploma for educational and scientific degree 'doctor'
- I.5. Professional experience certificate

### **II. Research activity supporting documents**

- II.1. List of all scientific publications of the applicant
- II.2. List of scientific publications for participation in the competition
- II.3. Reference for fulfillment of the minimum national requirements under Art. 2b of the Act on development of the academic staff in the Republic of Bulgaria and the additional regulations of the the Faculty of Chemistry of Plovdiv University
- II.4. Annotation and self-assessment of the applicant’s scientific contributions
- II.5. List of citations
- II.6. Statement for originality and assurance of the documents submitted
- II.7. Reference for project participation
- II.8. Reference for scientific conference participation

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\*The Act on development of the academic staff in the Republic of Bulgaria states “reader” as a corresponding English term of Bulgarian “доцент“. In academic hierarchy of the European universities more popular is the term “associate professor” and in Germany – “docent”.

### **III. Teaching activity supporting documents**

III.1. Reference for teaching activities: academic courses, development or adaptation of academic courses programmes of study, supervision experience

All required documents are available, together with information on additional criteria related to the selection procedure. The documentation has been carefully and accurately prepared in accordance with all requirements and recommendations.

#### **A Brief Biographical Reference**

Ms Antoanaeta Angelacheva graduated with excellence from the Faculty of Chemistry of Plovdiv University's Master program of Chemistry. She majored in Inorganic chemistry, Teacher in chemistry and Chemical technology (1994). She defended her Master thesis "Influence of the electrode material on the oxidation reaction rate of hydrogen peroxide, ascorbic acid, uric acid and glutathione" in the Department of Physical Chemistry.

Ms. Angelacheva defended (2007) a PhD thesis on the environmental education in chemistry (9 grade of the secondary school). Since 1999 till now she has occupied consistently positions of assistant professor (1996-1999), senior assistant professor (1999-2006) and chief assistant professor (2006-) at the Faculty of Chemistry of Plovdiv University, Department of General and Inorganic Chemistry and Methodology of Chemistry Education.

#### **Scientific Research Activities**

For a period of nearly 20 years the applicant's publication records contain an impressive total number of scientific works: 3 monographs, 49 publications in scientific journals and collections, 7 conference papers in full text. In addition, 8 handbooks are presented.

Dr. Angelacheva participates in the competition with one monograph as a habilitation thesis, a book based on her PhD dissertation, another monograph, 21 articles, and 3 handbooks.

Seven articles have been published in *Chemistry/Bulgarian Journal of Science Education* – a SCOPUS abstracted and indexed journal. The candidate is the sole author of two of the seven articles, first author of two papers, and two papers have been published in English. In the last five years, however, she has not published in journals refereed and indexed in world-renowned scientific databases. The last paper of that kind appeared in 2016. 21 papers were printed in non-indexed journals with scientific review or in edited collective volumes. Dr. Angelacheva's contribution is significant given that she is the sole author of all but one of these articles. 10 papers have been published in the last five years and 6 items have been submitted

in English. The candidate is the sole author of two handbooks and the first author of a third handbook submitted for the competition.

The applicant fully meets the conditions of Art. 24 Para 1, including the minimum national requirements under Art. 2b Para 2, 3 and 5. A comparison between the required minimum number of points for the academic position of associate professor in the Pedagogy of Teaching scientific field, and the individual results of the candidate is shown in Table 1.

Table 1.

<b>Group of indicators</b>	<b>A</b>	<b>B</b>	<b>Г</b>				<b>Д</b>		
<b>Indicator</b>	1.	3.	4.	5.	6.	7.	11.	12.	13.
<b>Min. national requirements/points</b>	<b>50</b>	<b>100</b>	<b>200</b>				<b>50</b>		
<b>A. Angelacheva/points</b>			100	75	135	205	75	110	-
	<b>50</b>	<b>100</b>	<b>515</b>				<b>185</b>		

As can be seen from Table 1, Dr. Angelacheva significantly exceeds the required quantitative criteria, especially for the Group Г and Д indicators, with 315 and 135 points, respectively.

The candidate's research and the corresponding publications could be divided into three thematic areas: *School chemistry experiments*, *Environmental chemistry education through chemistry teaching in secondary school*, *Organization and control of chemistry teaching process*.

#### ***Publications on school chemistry experiments***

For a long time, laboratory and demonstration chemistry experiments in Bulgarian schools were neglected. Being an experimental science, chemistry should not be taught, studied and evaluated without hands-on experiments. The existing updated educational standards for the subject *Chemistry and Environmental Protection* focus on the development of key competences through inquiry-based teaching and learning: planning of experiments, testing students' own ideas and hypotheses, finding the necessary information and collecting it by combining elements into a new model or proposing alternative solutions, performing experimental manipulations and operations, etc. Appropriate methods of applying chemistry experiments in class can facilitate and enhance the learning of abstract concepts and theories in science, particularly chemistry. Hands-on work helps students understand basic facts and scientific concepts while keeping the exciting nature of chemistry. Therefore, Ms. Angelacheva's research in the area of teaching chemistry experiments is of great importance.

The main publication in this field is the monograph presented as a habilitation thesis and entitled *Experiment and observation in chemistry teaching* (Macros Publ., Plovdiv, 157 p.). The methodology, the ways of applications and implementation of the school chemistry experiment are the core content of the habilitation work. In chapters one (32 pages) and two (20 pages) the author presents an overview of scientific literacy definitions, a brief description of ways of scientific cognition and methods of teaching chemistry in school. The third chapter is devoted to the types, goals and place of observation and chemistry experiments in school practice. In the fourth chapter, Dr Angelacheva proposes a methodology for training of prospective chemistry teachers to apply the school chemistry experiment. Overall, the book is relevant as a habilitation thesis.

The remaining 4 articles were published in university research proceedings and conference proceedings books. Three of the papers are of most interest to me. Three of the papers are of greatest interest to me: Possibilities of the research approach for the formation of key competences in chemistry education (2021), Assessment of the qualities of teaching experiments which illustrate the greenhouse effect (2016) and The teaching experiment in chemistry and the problem of smoking (2013).

Studies on the methodology and implementation of chemistry experiments in schools have been presented in 7 papers. Three of them have been published in *Chemistry/Bulgarian Journal of Science Education*, abstracted and indexed by SCOPUS. The remaining 4 articles have been published in university scientific collections and conference proceedings. Three of the papers are of most interest to me: *Possibilities of the inquiry-based approach for the formation of key competences in secondary school chemistry education* (2021), *Assessment of the qualities of teaching experiments which illustrate the greenhouse effect* (2016) and *The teaching experiment in chemistry and the problem of smoking* (2013). These articles simultaneously address the candidate's two research fields – that of the chemistry experiment as a didactic approach and environmental chemistry education in secondary school.

In addition, Dr Angelacheva has contributed to the topic of school chemistry experiments with three Plovdiv University Press editions: *Chemistry: observations and experiments. Module non-metals* (a sole author, 2014, 148 p.), *Methodology and techniques of the school chemistry experiment, Part I* (a sole author, 2006, 175 p.) and *Part II* (a co-author, 2010, 111 p.). The first of these three handbooks is designed for teachers and their 8 and 9 grade students, and the latter two represent useful laboratory handbooks for prospective chemistry teachers. The three handbooks constitute good practical follow-up of Dr Angelacheva's research on school chemistry experiments.

### ***Publications on environmental chemistry education in secondary school***

A book based on the candidate's dissertation thesis, together with 14 articles have been submitted for the selection procedure. 4 of them have been published in *Chemistry/Bulgarian Journal of Science Education*. As already noted, the journal is abstracted and indexed in SCOPUS.

The book *Modern aspects of environmental education in chemistry education in secondary school* (Plovdiv University Press, 110 p.) has been recently (2019) published. The *Chemistry and Environmental Protection* subject has been introduced in Bulgarian school since 2000. However, the practice has shown that despite the equal treatment of the notions of *chemistry* and *environmental protection* in the school subject title, the environmental protection took a back seat in teaching. It is therefore in the interest of both teachers and students the environmental chemistry teaching and learning approaches to be developed and properly implemented in class. In this context, the candidate's book and publications on methodology of environmental chemistry teaching are up-to-date and useful. I would, however, like to add a comment regarding the use of the terms *ecological education* and *environmental chemistry education*. Ecology relates to the study of relationships between living organisms (plants, animals, bacteria, humans) and the environment whereas the environmental chemistry concerns the issues of pollution and protection of the environment. The latter deals with the environmental impact of pollutants, the reduction of contamination and management of the environment. It is the study of chemical processes that occur in environment. In everyday life the term ecology and its derivatives ecological, eco-, eco-friendly are widespread and often replace the term environmental but from scientific perspective distinction should be made between the two terms.

Among the 14 articles in the scope of environmental chemistry education I would like to mention No. 16 in the list submitted, published (2018) in *Management and Education*, a journal of Burgas University „Prof. Dr Assen Zlatarov“. In this paper the author presents an experimental study on the correlation between environmental knowledge, on one hand and 8th, 9th and 10th grade students' attitudes and values towards the environment. The study takes place in a period of three school years with a cohort of experimental and control student groups. I agree with the author' note that such longitudinal studies are rare in the practice of school chemistry education and I appreciate the work that has been done.

### ***Publications on organization and control of the chemistry teaching process***

Recently, in 2020, Dr Angelacheva has published a book titled *Organisational forms of chemistry teaching* (Macros Publ., Plovdiv, 128 p.). This is a third monograph she has submitted for the current procedure in addition to her habilitation book published in the same year and the monograph based on her dissertation thesis a year earlier. In this third monograph she has set out her views on the organization of the chemistry education in school. She has presented structure and plans of different classroom chemistry lessons as well as some extracurricular and out-of-school activities. With regard to control in chemistry education, five articles have been published in the last 5 years, mostly in the area of student achievement testing.

### **Citations**

Compared to the rather large number of applicant's publications the number of their citations appeared to be somewhat modest: 16 citations of 13 publications (autocitations excluded). 14 of the citations are made by 3 authors. 5 citations appeared in SCOPUS abstracted and indexed Bulgarian journal: *Chemistry: Bulgarian Journal of Chemistry Education*. According to SCOPUS the Hirsch index of Dr Angelacheva is 1 (excluding autocitations and all co-authors). Nevertheless, the number of points (185) for Group Д (Citations) go well beyond the required 50 points.

### **Participations in scientific projects and events**

For a period of 8 years, Dr Angelacheva reported a participation in 26 scientific conferences on science education: 9 national and 17 international events. 22 of the conference participations are with posters and 4 – with oral section reports.

The applicant has declared 4 participations in projects as a member of a scientific project group. Three of the projects are funded by the Research Fund at faculty level and one is within the framework of the Operational Programme "Science and Education for Smart Growth", "Support for Success".

### **Assessment of the personal contributions of the candidate**

The Account of the scientific contributions is very well and meaningfully written, correctly reflecting candidate's contributions. The personal contribution of Dr Angelacheva for the presented achievements is undoubted.

### **Teaching activity**

For the past three academic years, Dr. Angelacheva has 2074 classroom hours, which is almost double the 1080 required by the Department of Chemistry. She has had lectures and practical activities with students from various Bachelor and Master programmes and has been a research supervisor of nine graduate students.

### **Personal impressions**

I have had no personal professional contacts with Ms Antoaneta Angelacheva but I would like to point out that she is a well-known and respected specialist in the field of chemistry education.

### **Conclusion**

In summary, the documents submitted for the evaluation and all research and teaching activities of Dr Antoaneta Angelacheva prove that she fulfils and even exceeds the requirements of the Development of Academic Staff in the Republic of Bulgaria Act, the corresponding Regulations as well as the additional recommendations of Plovdiv University, Faculty of Chemistry for Associate Professor (Reader) position.

This gives me reason to vote for her appointment as an Associate Professor in the University of Plovdiv Paisii Hilendarski in field of higher education 1. Pedagogical Sciences, professional field 1.3. Pedagogy of Teaching ... (Methodology of Teaching Chemistry).

30.08.2021

Reviewer: