

OPINION

by **Antoaneta Anastasova Angelacheva, PhD**

Assoc. Prof. at Plovdiv University “Paisii Hilendarski”, Faculty of Chemistry,
Department of General and Inorganic Chemistry with Methodology of Teaching Chemistry
of dissertation for the creation of the educational and scientific degree “**Doctor**”
by field of higher education *1. Pedagogical sciences*
professional management *1.3. Pedagogy of teaching...*
doctoral program *Methodology of teaching chemistry*

Author: *Kalin Nikolaev Chakarov*

Subject: *Areas of difficulty in chemistry content in terms of students and teachers. Difficulties of students in learning organic chemistry at basic level*

Scientific adviser: *Assoc. Prof. Alexandria Gendjova, PhD – Sofia University “St. Kliment Ohridski”*

1. General description of the materials submitted and the procedure

The materials presented by doctoral student *Kalin Nikolaev Chakarov* are in accordance with the requirements of the Law on the Development of the Academic Staff of the Republic of Bulgaria. The set of documents includes:

- CV in European format;
- minutes of the Department council, related to reporting on the readiness to open the procedure and preliminary discussion of the dissertation work;
- dissertation work;
- author’s abstract;
- declaration of originality and authenticity of the attached documents;
- reference for compliance with the minimum national requirements;
- copies of scientific publications.

The scientific jury for the procedure for the defense of the dissertation was selected and approved by Order № RD 38-87 of 16.02.2023 of the Rector of Sofia University “St. Kliment Ohridski” on the grounds of Article 4 of the Law on the Development of the Academic Staff of the Republic of Bulgaria.

2. Topicality of the problem

In order to ensure quality education and conduct a successful educational reform in the Bulgarian school, the issue of identifying the areas of difficulties in teaching the subject, both from the point of view of students and teachers, is particularly important. The answers to this question

would be relevant to the theory and practice of chemical education, to the preparation of future chemistry teachers, as well as to curriculum and textbook authors.

The dissertation study presents the theoretical and empirical study of the author of the areas of difficulty in teaching and studying chemistry and environmental protection and the specific difficulties in studying organic chemistry at the basic level. The problem is topical and corresponds to the needs of establishing the topics of the chemistry curriculum, which are difficult for students in the implementation of a learning process set out in the normative documents.

3. Knowledge of the problem

The PhD student has studied and analyzed correctly specialized literature on the problem of difficulties in teaching and studying chemistry in secondary school. The total number of cited literature sources gives reason to assume that the author knows the problem in both theoretical and practical terms. This is a good basis for conducting the study and to develop the dissertation work.

4. Research methodology

The methodology chosen by PhD student *Kalin Chakarov* for conducting the study is adequate to the goal and tasks set, which is an important prerequisite for obtaining objective results. In the dissertation work are applied a variety of methods of scientific research: theoretical study; survey and interview of teachers and students; pedagogical experiment; testing; mathematical and statistical methods for analysis of empirical data. The methods of pedagogical research and the means for their realization have been appropriately selected.

5. Characteristics and evaluation of the dissertation work and contributions

The dissertation work is structured in six chapters, bibliography and 6 applications. The total volume is 167 pages, of which 119 are main text. The dissertation is richly illustrated – 60 tables and 15 figures are included.

In the Introduction (First Chapter) the choice of the theme of the dissertation is argued. The purpose and research tasks are correctly formulated, the methods of the study are indicated. The content of the working concepts used is specified.

In Chapter Two, an analysis of the scientific literature and previous scientific studies devoted to the topic of the dissertation is made. The factors related to the specifics of chemistry as a science and as a subject are outlined, which contribute to the emergence of difficulties for students in chemistry education. As a result of the literature review, factors related to the student's personality, knowledge and learning process that contribute to difficulties are also indicated. The peculiarities of organic chemistry education and the associated difficulties that could arise in the learning process are also highlighted.

Chapter Three presents the methodology of the empirical research, carried out in two stages. For each of the stages, the objectives and research questions are clearly defined; the samples from teachers and students, the research methods, the diagnostic toolkit and the analysis of empirical data are described.

In the Fourth and the Fifth chapters are presented the results of the pedagogical experiment carried out, their statistical analysis and interpretation. These chapters are rich in evidence – tables and figures. The empirical study is presented with particular attention and precision.

In the Conclusion (Sixth Chapter) conclusions from the dissertation study are formulated, theoretical and practical and applied contributions are indicated, as well as the guidelines for future research on the problem under consideration are outlined.

Applications present the developed questionnaires for students and teachers for the two stages of pedagogical research, diagnostic test, expert assessment card of the test.

6. Assessment of the publications and personal contribution of the doctoral student

The results of the individual stages of pedagogical research have been reported at 2 conferences and have been framed in 4 articles published in various specialized journals. The proposed publications are proof of the good popularization of the results of the research, as well as of the ability of the doctoral student to work in a team. The number and quality of publications meet the requirements of the Rules for Implementation of the Law on The Development of Academic Staff in the Republic of Bulgaria.

7. Abstract

The author's report reflects the essence of the theoretical staging, the studies carried out, the conclusions and contributions received. The volume of the author is 44 pages, which allows the reader to quickly familiarize himself with the ideas and contributions in the dissertation.

8. Recommendations for future use of dissertation contributions and results

The current dissertation and methodological publications present doctoral student *Kalin Chakarov* as a professional and skilled researcher. It follows from the formulated conclusions and contributions to the dissertation that there is an interesting and up-to-date study with practical application, which is appropriate to promote among bulgarian teachers and to be implemented in practice. I would recommend that the doctoral student continue his work on the guidelines outlined in the dissertation for future studies and development.

CONCLUSION

The dissertation contains scientific, scientific-applied and applied results, which represent an original contribution to science and meet all the requirements of the Law on Development of

Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for implementation of LDASRB and the relevant Regulations of the University of Sofia “St. Kliment Ohridski”.

The dissertation shows that the doctoral student *Kalin Nikolaev Chakarov* has in-depth theoretical knowledge and professional skills in the scientific specialty Methodology of teaching chemistry, demonstrating qualities and skills for independent research.

Due to the above, I confidently give my *positive assessment* of the research presented by the above peer-reviewed dissertation, abstract, results and contributions, and *propose to the esteemed scientific jury to award the educational and scientific degree "doctor" of Kalin Nikolaev Chakarov* in the field of higher education: 1. Pedagogical sciences; professional field: 1.3. Pedagogy of teaching ...; doctoral program: Methodology of teaching chemistry.

10 April 2023

Author of the opinion:

Plovdiv

(Assoc. Prof. Antoaneta Angelacheva, PhD)