REVIEW

by **Assoc. Prof. Dr. Mirena Damyanova Legurska** - Sofia University “St. Cl. Ohridski "

of the materials submitted for participation in competition (State Gazette No. 31 / 12.04.2019)
for occupying the academic position of "Professor" at the University of Paisii Hilendarski
in the field of higher education 1. Pedagogical sciences,
professional field 1.3. Pedagogy of Education in…, (Methodology of Physics Education)
at the Department of Educational Technology, Faculty of Physics and Technology

In the professor competition, announced in the State Gazette, issue 31 / 12.04.2019 for the needs of the Faculty of Physics and Technology at the University of Plovdiv "Paisii Hilendarski", Assoc. Prof. Dr. Zhelyazka Dimitrova Raykova, PhD.

By order № P33-2886 of June 11, 2019 from the Rector of Plovdiv University “Paisii Hilendarski”, I was appointed as a member of the scientific jury of a competition for the academic position "Professor" of Plovdiv University “Paisii Hilendarski” in the Higher Education field 1. Pedagogical sciences, professional field 1.3. Pedagogy of Education in… (Methodology of Physics Education), announced for the needs of the Faculty of Physics and Technology.

Only one candidate has submitted documents for participation in the announced competition: Assoc. Prof. Zhelyazka Dimitrova Raykova, PhD from the University of Plovdiv “Paisii Hilendarski” .

The set of materials, presented in paper and electronic form, presented by Assoc. Prof. Zhelyazka Dimitrova Raykova, is in accordance with the Rules for Development of the Academic Staff of Plovdiv University “Paisii Hilendarski”.

The candidate Assoc. Prof. Zhelyazka Dimitrova Raykova, PhD, is the author of 113 publications to the present moment. 55 publications were presented for participation in the competition for the professor academic position, of which: 1 monograph, 46 articles and reports and 8 books and aid materials. The number of publications in which she is the sole author is 13.

The materials are precisely systematized and presented for participation in the competition for the professor academic position of the Plovdiv University "Paisii Hilendarski".

Assoc. Prof. Zhelyazka Raikova is currently the Deputy Dean of the Faculty of Physics and Technology at the Plovdiv University Paisii Hilendarski, organizing and managing the activities related to the accreditation procedures and the candidate students campaign.

For more than 30 years Assoc. Prof. Dr. Zhelyazka Raykova has worked at the Faculty of Physics and Technology and has consistently held academic and leadership positions. Her scientific interests are in the fields of pedagogy, didactics of physics, ICT in education, etc.

She is chairman of the Union of Physicists in Bulgaria, Plovdiv Branch (3 years), member of the Board of Directors of the Union of Physicists in Bulgaria - (9 years), member of ESERA and GIREP, member of the Union of Scientists in Bulgaria, Plovdiv Branch.

The high assessment of the teaching and pedagogical activity and the preparation of the candidate for the professor academic position can be justified by her professional involvement and her competent attitude to work with students in physics. Her research work on international and national projects is also a confirmation of the professional abilities of Assoc. Prof. Zhelyazka Raykova, PhD in relation to the scientific field and professional direction of the competition. The work with physics and astronomy teachers extends the scope of the candidate's teaching and pedagogical activity.

My high appreciation of the scientific and applied activity of Assoc. Prof. Zhelyazka Raykova, PhD, is the result of the analysis of the scientific works and the established contributions in theoretical and practical terms.

The 55 submissions, 13 of which she is a sole author, conceptualize alternatives to training through the use of information and communication technologies. The scientific knowledge in the field of modern didactics of physics is systematized and valuable methodological solutions are offered. The scientific articles and reports from scientific conferences, textbooks and aid materials directly support education process

A valuable work on the methodology of physics training is the presented monograph "Modern Trends in Physics Education". The monograph examines current issues about the state and some trends in the pedagogy of physics education in high school. Emphasis is placed on the problems associated with the constructivist paradigm in physics education and its practical application in Bulgarian schools, in scientific literacy, as current tendency in science education. The place of the inquiry based teaching is highlighted as an important tool for the realization of physics education. The text presents the results of research conducted by the author and shared good practices from her experience, which enriches the theory and practice of physics education. The innovative ideas are noted in the monograph, considered for the first time in the context of physics education at the Bulgarian school.

Chapter one is devoted to the topic of constructivist theory in pedagogy, and in particular in physics education. The constructivist theory is the basis on which the inquiry-based learning is developed. The interest in inquiry-based learning has been intensified by teachers, scholars and international organizations for research in education (PISA, TIMSS).
In Chapter Two of the book, the work experience of the author in the European project *CHAIN REACTION* and the dissertation research conducted at the University of Plovdiv has been shared. The formation of scientific literacy is a contemporary trend in science education, which aims at rethinking and updating the goals of education in the direction of forming knowledge, skills and competencies to solve real problems. The complex and interdisciplinary nature of this knowledge and skills determines their place in science education and in physics education in particular.

The third chapter of the book addresses some aspects of the topic of scientific literacy. This topic is extensive and requires a thorough understanding of scientific methodology and philosophy. Her presentation in the book is consistent with the study of physics in high school in modern conditions. The importance of scientific literacy is linked with its social significance.

The book presents in a critical some trends in physics education, with both positive and negative effects. These trends are specific for science education, but the context they are addressed in the monograph and in the given examples is closely related to physics education. For the monograph writing publications of famous authors, with whom the author has worked in joint projects and studies were used (Prof. Norman Lederman, Prof. Barbara Crawford, Prof. Mia Ranikmae, Prof. Lamanauskas).

The research presented in the scientific articles and reports can be divided into several thematic blocks:
a) Modern trends in school physics education - constructivist theory and its place in physics education; scientific literacy and physics education; the inquiry-based learning approach in physics education and use of ICT in physics education
b) Effeciency of physics education - conducted studies regarding teaching documentation and contribution to its creation and methodology of studying some topics from the school course in physics and astronomy
c) Training of future physics teachers

A. Current trends in school physics education

Constructivist theory and its place in physics education

The theory of organization of physics education has been enriched with the emphasis on some contemporary approaches in physics education related to the constructivist theory, active learning and the formation of procedural skills (Publications No. 5, 6, 8, 15, 27, 48).

Scientific Literacy and Physics Education

New emphasis is placed on the problem of the formation of scientific literacy in physics education. Internationally, numerous documents and scientific publications related to the topic have been examined and conclusions and recommendations for the strategies for improvement scientific literacy in the Bulgarian school have been made (Publications Nos. 1, 19, 33, 47, 48, 55). The possibilities of the experimental activity in studying the physical module of the subject "Man and nature" as an important factor for the formation of scientific literacy were analyzed (Publications No. 33, 35), as well as the possibilities offered by the national educational documents - State educational standards for educational content and curricula in physics (Publications No. 19, 33, 38, 48).

An inquiry-based learning approach in physics education

The main contributions in this direction are both theoretical and practical. The theory of the methodology of physics education has been enriched, with a new emphasis on the possibilities of the inquiry-based learning approach for building motivation to study science (Publication No. 28) and for the study of specific topics of educational content in physics for all stages of secondary school. (Publication Nos. 29, 30, 31). Under the guidance of the author, a dissertation research is carried out related to the design of a didactic model for the applying of the inquiry-based learning approach in the physics education (Publications No. 41, 44). This research enriches the pedagogical science with regards to the adaptation of modern methods in the physics education in Bulgarian school. It is the first one related to physics education in Bulgaria.

Information Communication Technology (ICT) in Physics Education

The author's contributions on this topic are in two directions: updating the preparation of future physics teachers for ICT and exploring the application of the most up-to-date trends in physics education - augmented reality, mobile technologies and internet-based resources. The participation in the international CAT project, related to current trends in science education regarding the use of ICT (Publications No. 4, 8, 9, 10, 11, 12), allows the author to participate in an international study on the problem condition. The publications related to enhancing the informational skills of science teachers (Publications No. 23,24,37,50) are extremely valuable for pedagogical practice. Under the guidance of the author, a dissertation research of a cognitive-didactic model for the use of the technology "Augmented reality" with mobile devices in physics education was conducted and successfully defended (Publications Nos. 24, 32, 34). The topic of the application of modern ICT in physics education has been investigated by the author with regard to the design and use of training Internet resources (Publications No. 39, 40, 42, 43).

B. Efficiency of Physics Education

Methods of studying certain topics in the school physics course

Ideas for operationalizing training objectives, planning guidelines and various approaches to organizing training have been proposed. They meet the modern requirements for educational literature and create optimal opportunities for achieving the results determined by the State Educational Requirements / State Educational Standards and study aid materials, which have practically implemented some of the author's theoretical developments (Appendices No. 2, 6, 13, 17, 18, 21, 22, 25, 26, 28, 29, 30, 35, 39, 44, 45, 46, 51,52, 53 and 54).

The author contributes to the improvement and enrichment of the methodology of teaching physics on specific topics of the educational content, offering methodological guidelines for the more effective study and overcoming some difficulties. Some of the proposed ideas are based on pedagogical experiments, which examine in practice the state and tendencies in the study of *some topics* of the school course in physics and astronomy (transformers, atomic nucleus, mechanics, elementary particles), others are as a result of *work with teachers* and sharing of *good practices* (Annexes 2, 6, 13, 16, 17 and 18).

Ideas with ontodidactic character are proposed for updating the content of physics in high school by enriching it with topics related to *quantum information* and focusing on the formation of experimental skills in the study of *elementary particles*, tailored to students' cognitive abilities (Appendix No. 17 , 25).

The author's research on the place, role and importance of the *integral approach* in the study of physics and astronomy and the possibility of forming an *ecological culture* in the lessons of physics can be considered as a contribution for the enrichment of the theory of the methodology of physics education (Appendix No. 22 , 45, 46).

C**. Training of future physics teachers**

Assoc. Prof. Zhelyazka Raykova has thirty years of experience in teaching students, future teachers of physics and astronomy. In this regard, she has developed *teaching and examination materials and curricula* for 15 training courses. The methodological (didactic) models built in them enrich not only the teaching methodology, but also have applied practical significance, because they can be multiplied and applied in the learning process and thus improve its quality. By their nature, research, conclusions and models are an innovation in physics education that has the potential to meet the demands of time, enhancing the quality of knowledge and skills formed and linking them to contemporary challenges in all areas of life. An opportunity has been opened for future research in the field of the theory and practice of physics education in current problems and their application in the conditions of the Bulgarian school.

Much of the presented work is due to work on research and applied projects - 12 projects in the last 10 years. During the period from the end of 2008 to the beginning of 2019, the candidate participated in 19 conferences (international and national) with 28 reports, 4 of which were plenary. She has lectured on the European program ERASMUS + at the Universities of Craiova (2019) and Patra (2010). She is a member of the editorial board of the journal Physics: Methodology of Education and of the collectanea of Scientific Papers (Physics) in Plovdiv University. She has provided scientific guidance to 4 PhD students, one of whom has finished successfully, two have been finished with the right of defense their thesis and one is continuing her studies in the doctoral program “Methodology of Physics Education”. For the period 2009 - 2019 Assoc. Prof. Raikova participated in the scientific jury, having written 12 standpoints and 5 reviews.

CONCLUSION

The documents and materials presented by Assoc. Prof. Zhelyazka Dimitrova Raykova meet the requirements of the Academic Staff Development Regulation of the Republic of Bulgaria and the Regulations for the implementation of this law, the corresponding Regulations of the University of Plovdiv “Paisii Hilendarski”.

The candidate in the competition has submitted a sufficient number of scientific papers, published after the materials used in the competition for Associate Professor. The publications contain original scientific and applied contributions, some of which have been published in journals and scientific proceedings abroad. Theoretical developments are of practical relevance as they are directly oriented towards physics education. The scientific and teaching qualification of Assoc. Prof. Dr. Zhelyazka Dimitrova Raykova is **undoubted.**

The results achieved by Assoc. Prof. Zhelyazka Dimitrova Raykova in the teaching and research activities are in **full compliance** with the requirements of the Faculty of Physics and Technology, adopted in connection with the Regulations for the implementation of the Academic Staff Development Regulation of the Republic of Bulgaria.

After getting acquainted with the materials and scientific works presented in the competition, analysis of their importance and the scientific, applied and applied contributions contained therein, I find it justifiable to give my **positive assessment** and **to propose** to the Scientific Jury to prepare a report proposal to the Faculty Board of the Faculty of Physics and Technology for the selection of Assoc. Prof. Zhelyazka Dimitrova Raykova, PhD at the Academic Position "Professor" at the Plovdiv University “Paisii Hilendarski” in professional field 1.3. Pedagogy of education in… (Methodic of Physics).

02.10. 2019 Prepared by:
Sofia Assoc. Prof. Mirena Legurska, PhD