

OPINION

by Dr. Mirena Damyanova Legurska – Associate Professor at Sofia University "St. Kliment Ohridski" – Faculty of History

regarding the dissertation for the awarding of the educational and scientific degree "Doctor"

in: field of higher education: 1. Pedagogical Sciences

professional direction: 1.3. Pedagogy of Teaching...

doctoral program: Methodology of Teaching Biology

Author: Kalina Emilova Ivanova

Topic: Formation of Practical Knowledge and Skills in Students through STEM Education (Biology and Health Education – 7th Grade).

Scientific supervisor: Assoc. Prof. Dr. Delka Vasileva Karagyozeva-Dilkova - Plovdiv University "Paisii Hilendarski"

1. General presentation of the procedure and the doctoral candidate

By order No. ПД-21-1417 dated 08.07.2024 from the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the scientific jury to ensure the procedure for the defense of the dissertation on the topic "Formation of Practical Knowledge and Skills in Students through STEM Education (Biology and Health Education – 7th Grade)" for acquiring the educational and scientific degree "Doctor" in the field of higher education: 1. Pedagogical Sciences; professional direction: 1.3. Pedagogy of Teaching; doctoral program: Methodology of Teaching Biology.

The author of the dissertation is Kalina Emilova Ivanova – a doctoral student in full-time training in the Department of "Botany and Biological Education" with scientific supervisor Assoc. Prof. Dr. Delka Vasileva Karagyozeva-Dilkova.

The materials presented by Kalina Emilova Ivanova in writing and electronic format comply with Article 36 (1) of the Rules for the Development of the Academic Staff of PU and include the following documents: request to the Rector of PU to initiate the procedure for the defense of the dissertation; CV in European format; protocol from the departmental council related to the report on the readiness to initiate the procedure and the preliminary discussion of the dissertation; dissertation; summary; a list of scientific publications on the topic of the dissertation; declaration of originality and authenticity of the submitted documents; report on compliance with the minimum national requirements for the scientific, teaching and/or artistic or sports activities of candidates for obtaining a scientific degree and for holding an academic position. The doctoral student has included 5 publications.

Short Biographical Data on the Doctoral Candidate

In 1997, Ms. Ivanova obtained an educational-qualification degree of Master, majoring in

Biology and Chemistry; professional qualification – Teacher of Biology and Teacher of Chemistry.

From 1998 to 2022, Kalina Ivanova has been a teacher of Biology and Chemistry successively at the Textile and Footwear Production Technical School in Plovdiv; TOH "Asen Zlatarov," Plovdiv; Secondary School "Tsar Simeon Veliki," Plovdiv; and Primary School "Yane Sandanski," Plovdiv, where since 01.09.2022, she has held the position of Deputy Director of Educational Activities to the present moment. She has participated in numerous forms of continuing education on various topics in the fields of pedagogy, psychology, and the methodology of teaching natural sciences. She holds a third professional qualification degree.

2. Topicality of the subject

The topic formulated by the doctoral candidate is extremely relevant and significant for contemporary science and educational practice. It skillfully combines two important aspects: on one hand, the formation of practical knowledge and skills in students, and on the other, their formation based on STEM education. There is a clear understanding of the problem. The doctoral candidate possesses good theoretical preparation necessary to achieve the goals of the dissertation. The dissertation demonstrates a good understanding of the research subject. The overall conduct of the research, the structuring of the dissertation, and the current and well-selected bibliography confirm my conviction.

3. Knowledge of the problem

The theoretical study presented in the introduction and the first chapter sequentially presents the main scientific views regarding the historical development of STEM education; the characteristics of STEM disciplines; their integration; the definitions of STEM and i-STEM; models for integrating STEM; active strategies, advantages, and benefits, as well as limitations in integrating STEM education. This chapter is enriched with texts on the skills/competencies of the 21st century.

All theoretical theses are commented on and analyzed by the doctoral candidate. This, along with her years of experience as a teacher, provides grounds to accept that the researched problem is understood in the necessary depth.

4. Research methodology

The pedagogical research is planned and implemented as a theoretical-empirical study. The methodological approach used to conduct the research is the pedagogical experiment, carried

out over three academic years – 2021/2022; 2022-2023; and 2023/2024. I believe that a methodologically correct approach has been chosen for conducting the research, where the tasks align with the dissertation's goal and provide a good guide for conducting the research. The significance of the results obtained is manifested in their applicability as well as the original methodology used to achieve the goals.

5. Characteristics and evaluation of the dissertation and contributions

The dissertation consists of 181 pages of main text and supplemental pages. The used literature described in the Bibliography section includes... 166 scientific sources and 5 electronic addresses) and 11 appendices. It comprises an introduction, four chapters, a conclusion, used literature, appendices, and a list of 8 publications related to the dissertation. The main content includes numerous figures illustrating the use of the chosen methodology. The processing of the collected information is appropriately structured and visualized through numerous tables and schemes. The appendices contain lesson scenarios; three expert cards for evaluating lesson units; two observation protocols with correctly formulated criteria and indicators; and two didactic tests, surveys, and interview questionnaires for 9th and 12th grades, respectively. Thus, the content of the dissertation is characterized as a serious, complete, and substantial development. The aforementioned characteristics define the nature of the dissertation as scientific-applied. The main contributions according to the author are four. From a practical perspective, the dissertation research is valuable for developing a methodological system for forming scientific literacy in teaching physics at the high school level through integrated and historical approaches.

Recommendations and Remarks on the Dissertation Research:

In the interest of the dissertation, it would be beneficial for the first three chapters to be combined into one theoretical chapter; It would also be good to establish a new chapter that conceptually presents the two models that are currently presented in the text and in the appendices.

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

The five articles and reports presented by the doctoral candidate Kalina Ivanova, based on the content of the dissertation, have been published in prestigious national editions. One publication is solo, while the other four are co-authored. Two of the publications are conference reports, and the other three are journal articles, two of which are published in a magazine and indexed with Web of Sciences. The proposed publications are evidence of the

successful dissemination of the research results and the doctoral candidate's ability to work in a team, take responsibility, and hold a responsible position. The contribution of the doctoral candidate in the publications is undeniable. The number and quality of the publications meet the requirements of the Rules for the Conditions and Procedure for Obtaining Scientific Degrees and for Holding Academic Positions at PU, and their content reflects the main results that have been sufficiently presented to a specialized scientific audience.

7. Abstract

The summary includes all necessary elements: relevance of the topic, goals, objectives, subject and object, a brief presentation of the three chapters, and the conclusion, and is in accordance with requirements for a precise, complete, and concise reflection of the dissertation.

8. Recommendations for future use of the dissertation contributions and results

I recommend that the doctoral candidate continue her research to expand the applicability of the results from the dissertation in pedagogical practice and to publish more independent publications, which will strengthen her name in the scientific and educational community. The ideas created for using the historical and integrated approaches to form and develop scientific literacy can be published in the form of a methodological collection, as they are invariant and could be successfully applied in the teaching of Biology and Health Education when studying other topics from the curriculum.

CONCLUSION

The dissertation contains mainly scientific and applied results that represent an original contribution to the education and training of those involved in WingTsun. It meets all the requirements of the Academic Staff Development Act of the Republic of Bulgaria (ASDA), the implementing regulations of the ASDA and the relevant regulations of the Paisii Hilendarski University of Plovdiv.

The dissertation shows that the doctoral candidate Kalina Ivanova possesses in-depth theoretical knowledge and professional skills in the scientific specialty Methodology of Teaching Biology, demonstrating qualities and skills for independent research.

Due to the above, I confidently give my categorically positive assessment of the conducted

research, presented by the above-reviewed dissertation work, abstract, achieved results and contributions, and **I propose to the honorable scientific jury to award the educational and scientific degree "Doctor" to of Kalina Emilova Ivanova** in the field of higher education 1. Pedagogical sciences; professional direction 1.3. Pedagogy of training in...; doctoral program Methodology of teaching in biology.

08/20/2024

Prepared the standpoint:.....

(Assoc. Prof. Mirena Legurska, PhD)