

OPINION

by **PhD Zlatoeli Atanasova Ducheveva, Assoc. Professor,**

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on the Thesis for awarding educational and scientific degree **PhD,**

Field of Higher Education: *1. Pedagogical Sciences*

Professional Area: *1.3. Pedagogy of Teaching in*

PhD Programme: *Methodology of Teaching in Informatics and Information Technologies*

Author: *Vera Petkova Shopova*

Topic: *Use of Information Technologies for Implementation of Interdisciplinary Connections in Natural Sciences Education in Pre-Gymnasium Level*

Scientific supervisors: *Prof. PhD Kosta Garov, Plovdiv University "Paisiy Hilendarski*

1. General introduction of the procedure and the PhD student

By order No. PD-21-2451 dated December 15th, 2023, and issued by the rector of the Plovdiv University "Paisiy Hilendarski" (PU), I have been appointed as a member of the scientific jury. I will ensure the procedure for the defense of a thesis on the topic *The use of Information Technologies for Implementation of Interdisciplinary Connections in Natural Sciences in middle school* for acquiring a PhD degree in the field of higher education *1. Pedagogical sciences, professional Area Pedagogy of Teaching in....*, doctoral program *Methodology of Teaching in Informatics and Information Technologies*.

The author of the thesis is *Vera Petkova Shopova* - a full-time PhD student at the Department of Teaching Methodology in Information Technology with supervisor *Prof. PhD. Kosta Andreev Garov* - Faculty of Mathematics and Informatics, "Paisii Hilendarski" University of Plovdiv

The paper materials presented by Vera Petkova Shopova are following Article 36 (1) of the Rules for the Development of the Academic Staff of the PU.

The PhD student has attached 6 publications and 3 citations.

Details about the candidate:

PhD student Vera Petkova Shopova has graduated from PU "P. Hilendarski", obtaining a master's degree and a teacher's qualification in Biology and Chemistry and a second master's degree for teaching Information Technology in middle school. Since 2022 she has been working as a teacher (Pencho Slaveykov Primary School, Belashtitsa village, Plovdiv region) and a senior teacher (Knyaz Alexander I Primary School, Plovdiv). In the specified period, she acquired the 5th (TrU St. Zagora) and the 4th Professional Qualification Degrees (SU "St. Kliment Ohridski", Sofia).

Given the professional and biographical data, we can say that the candidate has followed her professional path with consistency, dedication to work, and a desire for professional development and improvement over the years.

Social skills and competencies: working as a teacher with children of different backgrounds and interests, as well as participating in projects that develop communication and teamwork skills.

2. Relevance of the topic

The introduction of the thesis explains the need for integrating information technologies in the teaching of other academic disciplines, and the relevance of the problem is further developed in the thesis itself. Improving the theoretical and practical preparation of students and the formation of integrative concepts within individual subjects are among the main benefits that interdisciplinary connections facilitate in education.

The relevance of the considered problem is also determined by the paradigm for a competence approach and the application of pedagogical innovations in the education of adolescents. The integration of information technologies in teaching and the independent work of middle school students, also facilitate the teachers in meeting the expectations to keep up with new digital technologies, set by the digital generations. This once again emphasizes the relevance of the researched problem. In the research, a pragmatically oriented strategy is clearly stated, and several technological solutions for integrating information technologies in the teaching of natural science are outlined.

3. Knowing the problem

The theoretical analysis of the possibilities of using IT and the different realities in the educational process, as well as determining the essence of the concept of "interdisciplinary relations" in historical terms and from a pedagogical aspect, a good degree of understanding the problem is demonstrated (the bibliographic reference contains 63 literary sources in Cyrillic, 38 in Latin, 32 Internet sources, including normative documents relating to education in the disciplines of the natural-mathematical cycle and IT).

4. Research methodology

While finding the intersecting point between the use of information technologies in education, the creation of interdisciplinary connections in the natural scientific cycle, the ecological problems of our time, and the increasing quality and effectiveness of education, the PhD student applies an innovative approach to the development of an interdisciplinary methodological model and methodological toolkit for implementation of the model.

Each stage of the proposed interdisciplinary model specifies the goals, approaches, methods, and steps for their implementation in the classroom and extracurricular activities for middle school students. Good, working practices and completed projects were outlined, through which the research concept was implemented and tested. Criteria and indicators for the diagnosis of the results of the pedagogical experiment have been developed.

5. Characterization and evaluation of the thesis and the contributions

The thesis aims to research prospective issues that are relevant today. This research is done in 140 pages of main text, literature, and 3 appendices of tests and research results.

The interdisciplinary methodological model facilitates and outlines the advantages of the integration of the curriculum to promote active learning and stimulate students to develop their metacognitive skills, critical thinking, creativity, communication, and cooperation.

The PhD student accurately and precisely indicated the positives that the implementation of interdisciplinary and transdisciplinary trainings will bring not only to the students but also to the pedagogical community. The study also focuses on the need to form a learning community of teachers who "teach, self-train, share practices, while seeking like-minded people and helpers." (p. 49)

The setting of the research, the scientific-theoretical study of the specialized literature on the subject, the design of the research (goals, tasks, hypotheses, instrumentation) **as a concept**, the collected array of research empirical data, their analysis and the established results can be used by a wide range of interested parties: middle school pedagogical teachers, specialists, and students.

The model functions as a system for establishing interdisciplinary connections between the disciplines of the natural cycle and information technologies. It also contains a relatively stable configuration of elements with specific and permanent interrelationships between them. The conceptual structure of the constructed technological models and the connections between the individual components are schematically presented.

The outlined steps for describing the interdisciplinary methodological model and toolkit for implementing the model follow a clear methodological logic and have the qualities to ensure the achievement of the goals set in the thesis.

The research program shows the mutual connection and logical organization of the methodological model and the developed criteria for diagnosing the results of the pedagogical experiment. A longitudinal study was conducted with a large number of students, equally divided into control and experimental groups. I find a positive characteristic of the thesis in the

statistical validation of the main results. It was carried out with appropriate statistical procedures for pedagogical research.

6. Evaluation of the publications and personal contribution of the PhD student

The key results of the thesis are expanded through the scientific production of the PhD student. A stand-alone article is presented. Most of the proposed articles (five issues) and reports are co-authored with the scientific supervisor and other researchers. In all co-authored articles the PhD student Vera Shopova is the leading author. This is a strong indication of skills when it comes to team research work. The articles are compliant with the scientific metric indicators.

I positively evaluate the publications in scientific journals and corpora, three of which were also presented at scientific and educational forums. This is testimony of Vera Shopova's scientific and teaching interest and proof of her commitment to sharing the ideas and results outlined in the thesis with circles that are competent both in practice and in science.

7. Evaluation of the PhD abstract.

The presented abstract (26 pages, references for contributions, publications, citations, and literature) correctly reflects the essence of the content of the thesis. It objectively presents the main highlights of the research in theoretical and empirical aspects. Structurally it also meets the requirements.

8. Recommendations:

Language and style - tautologies (pages 33, 34, 53, etc.), errors, and inaccurate use of terminology (methods, techniques, technologies, etc.) are noticeable in the thesis. Expressions such as: "Extremely suitable for application in pre-high school and high school stages, according to the authors" were also noted (p. 68).

In my opinion, it would be more appropriate to present the object, the subject, the goals, the tasks, as well as the research tools in a separate chapter. The most appropriate place would be after the first chapter, and not in the introduction since they logically follow and are derived from the literature review. A research thesaurus could be made, with which the author could specify the meaning of the concepts she uses.

The applied research methods are only indicated as literature and are not sufficiently described and justified (p. 110)

When it comes to structure and ratios between the chapters of the thesis, the emphasis should be on the research and analytical part from which to draw the essential conclusions and to propose and prove the working model for integrating IT in education.

My recommendation to the PhD student's publication activity is to expand it in issues, referenced in global databases such as Scopus and WoS, which would increase the possibility for her work to be cited.

CONCLUSION

The thesis *contains scientifically significant results, which would be a valuable contribution to science*. The results meet the requirements set by the “Law for Development of the academic staff in the Republic of Bulgaria”, the regulations for the implementation of the Law, and the relevant regulations of PU "Paisiy Hilendarski".

Despite my recommendations and remarks, the thesis shows that the PhD student Vera Petkova Shopova possesses theoretical knowledge and professional skills, and proves her ability to conduct independent scientific research.

Having in mind this review, I evaluate the conducted research *positively*. Due to the research presented in the thesis, abstract, achieved results, and contributions, *I propose to the honorable scientific jury to award the educational and scientific degree "PhD"* to Vera Petkova Shopova in the field of higher education: Pedagogical sciences, professional direction 1.3. Pedagogy of training in....

Author of the review:

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