

REVIEW

by Prof. Todorka Zhivkova Terzieva, PhD
FMI in University of Plovdiv “Paisii Hilendarski”

of a dissertation thesis for obtaining the Educational and Scientific degree “Doctor”

in the Area of Higher education: **1. Pedagogical sciences**

Professional field: **1.3. Pedagogy of teaching in....**

Doctoral program: **Methodology of teaching in Information Technologies**

Author: Vera Petkova Shopova, a full-time PhD student

Department: „Teaching in Mathematics, Informatics and Information Technologies” in FMI at University of Plovdiv “Paisii Hilendarski”

Topic: Use of Information Technologies for Implementation of Interdisciplinary Connections in Natural Sciences Education in Pre-High School

Scientific supervisor: Prof. Kosta Andreev Garov, PhD, University of Plovdiv “Paisii Hilendarski”

1. General description of the presented materials

By order № ПД-21-2451 of 15.12.2023 of the Rector of the University of Plovdiv “Paisii Hilendarski”, I was appointed as a member of the Scientific Jury for a public defense procedure of a dissertation on the topic “**Use of Information Technologies for Implementation of Interdisciplinary Connections in Natural Sciences Education in Pre-High School**” for obtaining the educational and scientific degree “doctor” in the field of Higher education *I. Pedagogical sciences*; Professional Area *1.3 Pedagogy of teaching in...*, Doctoral program *Methodology of teaching in Information Technologies*. The author of the dissertation is Vera Petkova Shopova – PhD student in full-time form at the Department of Teaching in Mathematics, Informatics and Information Technologies of FMI, with supervisor Prof. Kosta Andreev Garov, PhD from University of Plovdiv “Paisii Hilendarski”, Plovdiv. At the first meeting of the scientific jury I was chosen as a reviewer of the dissertation thesis, according to protocol № 1/19.12.2023.

The set of materials on electronic media, presented by Vera Petkova Shopova is in accordance with the relevant law Art. 36 (1) of the Regulations for Development of the Academic Staff of University of Plovdiv (RDASPU). They are as follows:

1. An Application to the Rector of PU for the disclosure of the procedure for the defense of the dissertation.
2. CV in European format.
3. Protocol №1-2023/2024, 11.12.2023 of the Departmental Council (from the preliminary discussion of the dissertation with proposal for a jury and date).
4. Abstract:
 - 4.1. in Bulgarian;
 - 4.2. in English.
5. Declaration for originality and reliability of the attached documents.
6. Reference for the compliance with minimum national requirements.
7. List of scientific publications on the topic of the dissertation.
8. Dissertation thesis.
9. Copies of the publications on the dissertation topic.

The documents submitted are precisely formatted and arranged in accordance with the attached list. The doctoral candidate has attached 6 publications on the topic of the dissertation.

2. Brief biographical data about the PhD student

Vera Shopova graduated with a Master's degree at Plovdiv University "Paisii Hilendarski" and acquired the qualification "Teacher of Biology and Chemistry". During the period 2011-2012 she studied at the Faculty of Mathematics and Informatics of PU and acquired a Master's degree in "Teaching Information Technologies in Pre-High School". In 2016 she obtained her fifth professional qualification degree at the University of Thrace, Stara Zagora. In 2018, she graduated from Sofia University "Sv. Kl. Ohridski" and obtained a fourth PQD with a specialization in "Teaching Information Technology in Pre-High School".

During the period 1.03.2020-01.03.2023 Vera Shopova is a full-time PhD student at the Department of "Teaching in Mathematics, Informatics and Information Technologies", PhD program "Methodology of teaching Information Technologies".

From 2002 until 2011 she was a teacher at the junior secondary school "Pencho Slaveykov", village of Belashchitsa, municipality Rhodopi, region Plovdiv. From 2011 to 2023 she was a senior teacher at the primary school "Dimitar Talev", Plovdiv. From 2023 until now – senior teacher at the primary school "Knyaz Aleksandar I", Plovdiv.

Vera Shopova participates in a number of national programs and projects, she has been an IT mentor for students under the Student Practices project, a leader of groups of students under the European projects "Your Lesson" and "Success", and she is a certified Google Trainer Level 1 and Level 2 (2021 - 2023).

3. Relevance of the topic and expediency of the set goals and objectives

Information and communication technologies give us some new and innovative tools for problem solving that are applicable across all scientific disciplines. Much of the knowledge and strategies for discovering, formulating and solving problems are specific to the field. But there are a number of aspects of the process of solving a problem that are common to all fields and there can be a transfer of knowledge and skills when studying different disciplines. On the other hand, the application of cross-curricular connections in learning leads to increased student motivation and activity.

The set tasks, which are the subject of research in the dissertation work developed by Vera Shopova on “Using information technologies for the implementation of interdisciplinary connection in natural science education in pre-high school” arise from the need to develop and implement methodological approaches for the implementation of interdisciplinary links in education and the formation of specific competencies in science education. The introduction defines the aims and objectives of the study, the object, subject and hypothesis of the study. The main goal of the dissertation is to compile an interdisciplinary methodological model for science education in the 5th, 6th and 7th grade of primary school, which will realize an increase in the effectiveness of learning activities through the use of interdisciplinary links IT – science. Three tasks with several sub-tasks are formulated to realize the set goal,

4. Knowledge of the problem

The doctoral candidate has carried out a theoretical analysis and review of 101 literature sources, 63 of which are in Cyrillic, 38 in Latin and 32 Internet sources on the topic of the dissertation. A significant number of results obtained by Bulgarian and foreign authors have been cited. The dissertation work is the result of a thorough study of the considered problems and application of the acquired knowledge and skills in practice. From the research done it can be considered that PhD student Vera Shopova demonstrates theoretical and practical skills for independent conduct of a comprehensive scientific research.

5. Research methodology

The dissertation research used a set of activities to collect empirical data such as theoretical analysis and research on pedagogical experiences, as well as their processing through mathematical and statistical analysis. Theoretical and empirical research methods were used to realize the aims and objectives and to test the hypothesis: observation, comparison, analysis, modeling, theoretical generalizations, group discussions, discussions with current science teachers, and tests. The PhD student also used personal experience gained in teaching science with the application of IT to implement cross-curricular links in primary school.

The doctoral student conducted a didactic experiment, applying mathematical and statistical methods to process the experimental data. The toolkit used includes a set of tasks, tests and exam problems to test students' knowledge and skills. The chosen research methodology is suitable for achieving the set goals and objectives.

6. Characteristics and evaluation of the dissertation

The dissertation of Vera Shopova is structured in the following parts: introduction, three chapters, conclusion, references and three appendices. It contains a total of 184 pages, with 140 pages of main text, 12 pages of references and internet sources, and 18 pages of appendices. Main contributions, list of publications on the thesis, approbation of results, declaration of originality, perspectives for future development and acknowledgements are added.

The introduction presents the relevance of the research, subject, object, objectives of the research and structure of the dissertation.

In Chapter I, are presented opportunities for using IT in the educational process; the essence of the concept of “interdisciplinary connections” is clarified from a historical perspective and from a pedagogical aspect; the possibilities for the application of interdisciplinary connections in the educational process are discussed; the possibilities for integrating current ICTs into the teaching of natural sciences are examined; the main concepts and research methods related to the current dissertation are explained.

According to the reviewer, the first chapter presents a significant number of theoretical propositions that are not directly related to the subject of research of this dissertation. It would be good for the PhD student to focus on the need to develop a methodology for the application of IT for the implementation of cross-curricular links in science education in the junior high school.

Chapter II, according to the author, presents an interdisciplinary methodological model for science education with the application of IT for grades 5., 6. and 7., the objectives, tasks and expected results of each stage of the proposed interdisciplinary model are described and approaches, methods and means for their implementation in the classes and in the hours for extracurricular activities in the lower secondary stage of primary education are given. Seven projects are described, which have been implemented through cross-curricular learning and practically tested in grades 5., 6. and 7.

Chapter III presents the criteria and indicators for diagnosing the results of the pedagogical experiment. Next, the process of conducting a pedagogical experiment to verify the effectiveness of the proposed interdisciplinary model for science education in grades 5th, 6th, and 7th is described. The results of the pedagogical experiment conducted to verify the effectiveness of the proposed interdisciplinary approach are presented, statistically processed and analyzed. A total of 300 students from the “Dimitar Talev” Primary School in Plovdiv participated in the study. “Man and Nature” for the students of 5th and 6th grade and “Chemistry and Environmental Protection” for the students of 7th grade.

In the Conclusion, the results are described, conclusions and implications regarding the working hypothesis are formulated. Further, some perspectives for future development are

presented, the main contributions of the thesis are formulated, a list of publications and reports on the results of the thesis are given, 3 citations are listed. In the Appendices the tests used for the evaluation are included.

7. Contributions and significance of development for science and practice

The main contributions resulting from the dissertation thesis are of scientific-applied and applied nature, and can be formulated as follows:

- 1) An interdisciplinary methodological approach is proposed and tested for the realization of interdisciplinary connection between natural sciences and IT in the educational process and are indicated ICT-based methods and didactic approaches for implementing the proposed interdisciplinary approach.
- 2) Original projects for the implementation of an interdisciplinary methodological approach have been developed and tested in the training.
- 3) Criteria and indicators for diagnosis of training results have been developed.
- 4) A pedagogical experiment was implemented to carry out a diagnostic procedure with subsequent analysis of the results.

The relationships between the contributions, the tasks, the place of description in the thesis and the publications made are described in a table. I believe that the above contributions are sufficient for the award of the educational and scientific degree “Doctor”.

8. Evaluation of the dissertation publications

Doctoral student Vera Shopova has presented 6 publications on the subject of her dissertation in peer-reviewed publications, 5 of them in the journal “Education and Technologies”, 1 in a collection of reports from the fiftieth anniversary spring conference of the Union of Mathematicians in Bulgaria. All publications are in Bulgarian, 1 is independent, the others are with one co-author, with Shopova being the first author. The mentioned publications purposefully present separate parts of the dissertation research.

A review of the submitted documents shows that the PhD student meets the minimum national requirements (35 points) and satisfies the minimum of 30 points set out in the regulations for the implementation of the LDASRB. There is an approval of the results of the dissertation work. 3 citations of her publications are also indicated.

9. Personal participation of the PhD student

The presented documents and publications on the topic of the dissertation research, one of which independently demonstrates the indisputable personal contribution of Vera Shopova in the development and implementation in the educational practice of the author's interdisciplinary methodical approach for realizing interdisciplinary connections natural sciences – IT in the educational process. The long teaching experience and professional

qualification of Vera Shopova are the basis for independent scientific pedagogical research, as well as for the approbation of the obtained results in the educational process. The large number of students in the implementation of the didactic experiment makes a good impression. I have not discovered any plagiarism in the materials submitted to me for review.

10. Abstract

The submitted abstract is prepared in accordance with the requirements, consists of 33 pages and correctly reflects the content and structure of the dissertation work, presenting the main results achieved in the dissertation research.

11. Critical remarks, questions and recommendations

I recommend the PhD student to publish articles in refereed journals in English, which would increase the visibility of the results.

CONCLUSION

The dissertation of **Vera Petkova Shopova** *contains scientific-applied, and applied results, which represent an original contribution to science and meet* the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for application of LDASRB and the respective Regulation on the Development of the Academic Staff in University of Plovdiv “Paisii Hilendarski”.

The dissertation shows that the doctoral student – **Vera Petkova Shopova** has a profound theoretical knowledge and professional skills in the Methodology of teaching Information technologies.

Due to all of the above, I confidently give my **positive assessment** of the research presented by the above peer-reviewed dissertation thesis, abstract, achieved results and contributions, and I **propose to the Honorable Scientific Jury to award the educational and scientific degree “Doctor” to Vera Petkova Shopova** in the Area of Higher education 1. **Pedagogical sciences; Professional field 1.3.; Pedagogy of teaching in....**, Doctoral program **Methodology of Teaching in Information Technologies**.

28.01.2024

Plovdiv

Reviewer:

(Prof. Todorka Terzieva, PhD)