

# REVIEW

**under the procedure for acquisition of the educational and scientific degree “Doctor”  
by candidate Diana Starja,  
of the PhD Thesis entitled: “Personalization of secondary school mathematics  
education through the use of modern information technologies”**

In the Scientific field: **1. Pedagogical Sciences**

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

Doctoral program “Teaching Methodology of Mathematics and Informatics”

Department „Education in Mathematics and Informatics”,

**Faculty of Mathematics and Informatics (FMI), Sofia University “St. Kliment  
Ohridski” (SU),**

The review has been prepared by: **Prof. Nataliya Hristova Pavlova, D. Sc.,  
Department of Algebra and Geometry, Faculty of Mathematics and Informatics,  
Konstantin Preslavsky University of Shumen** as a member of the scientific jury for the defense of this PhD thesis according to Order № RD-38-669/ 23.12.2022 of the Rector of the Sofia University.

## **1. General characteristics of the dissertation thesis and the presented materials**

The set of materials presented to me for review in electronic format includes all the necessary documents.

The PhD student has attached 6 publications on the topic of the dissertation.

The dissertation was developed under the scientific supervision of Assoc. Prof. Dr. Nikolina Nikolova, SU "St. Kliment Ohridski" and Assoc. Prof. Dr. Bederiana Shyti, University of Elbasan, Albania.

The dissertation is structured into an introduction, six chapters, conclusions, contributions, references, documents and five appendices containing questions and programs for teacher education. At the beginning of the dissertation, the used abbreviations, 16 tables and 55 schemes and diagrams are appropriately described. The total volume of the book body is 244 pages, of which the main text is presented in 215 pages, and the rest are set aside for appendices to the dissertation and bibliography.

The PhD student has studied and analyzed more than specialized sources on the dissertation problem. There are a huge number of studies with interesting results in the given field, but I believe that the proposed bibliography is sufficient in this case. The theoretical analysis of the specialized literature is thorough and logical. The author knows the problems in both theoretical and practical aspects, which gives her a good basis for conducting the research and developing the dissertation work.

The methodology chosen by the PhD student for conducting the research is adequate to the set goals and tasks. The methods and means for their implementation have been well chosen. The presented analysis of the data from the research conducted among 210 teachers and 139 students of the 7th grade, to a large extent, gives the PhD student the basis to reach a number of conclusions and formulate her PhD thesis " model of a process that requires a deep understanding of the skills, needs, and talents of the students to be combined with many other psycho-pedagogical factors, on one hand, and the continuously updated implementation of educational technology innovations for personalization of teaching and learning math, on another ".

The *introduction* presents the research conducted by Diana Starya, clarifying the motives, relevance, object and subject of the research and formulating the main hypotheses of the research. The brief content of the dissertation is presented by chapter.

In the *first chapter* – “*Overview of the role of ICT tools in teaching mathematics. Approaches to their applications in the Albanian context*”, a reference review of the scientific literature on the issue is offered. Based on the studied more than 100 sources, some basic conclusions and recommendations have been drawn, aimed at the permanent training of teachers in the direction of applying ICT in mathematics education; the need to create an appropriate ICT infrastructure in schools; the university training of future mathematics teachers.

The *second chapter* is titled "*Personalized Learning in Mathematics*" and presents basic concepts of personalized learning. The mathematical context of the four main components was analyzed - reflection on students and setting their goals; targeted training; flexible path and pace; collaboration and creativity. A number of examples are given. Some of them are author examples.

Conclusions have been obtained. The main idea is that the application of ICT-tools in education helps to implement active learning and increases the cognitive abilities of students.

In the *third chapter* - "*Use of ICT in teaching mathematics in Albania: state-of-affaire*", detailed data from a survey with a target group of secondary school mathematics teachers. Questions related to the attitudes and preparation of teachers to apply ICT-means in mathematics education have been studied. In addition to the results of the survey, conclusions

based on a semi-structured interview conducted with 8 teachers are also presented. From there, some good practices related to real personalized mathematics learning in the classroom have been extracted.

The *fourth chapter* - "*Training teachers to provide personalized math education, supported by ICT tools*" presents aspects of mathematics teacher training in Elbasan, Albania, with a focus on ICT tools in mathematics education. The main problem identified for Albania is the small number of trainings aimed at the application of ICT tools. A "teacher training based on aspects of teaching student-centered learning styles, supported by educational technology to personalize the teaching of mathematics" is described.

In the *fifth chapter* - "*Validation of teachers' training on personalized math teaching, supported by ICTs.*", 3 case studies and 3 student-applicable experiments, which were carried out by the teachers who participated in the course described in the previous chapter, are presented in detail.

In the *sixth chapter* - "*Influence of ICT-supported personalized learning of mathematics on the motivation to learn mathematics*" data from a questionnaire survey focused on the attitudes of students from three experimental schools are presented. The obtained data show the desire of the students to apply ICT-tools in mathematics education.

In the *conclusion*, Diana Starja formulates conclusions and recommendations aimed at improving ICT preparation and the application of ICT-means in mathematics education. Observations from experiments conducted with specific platforms are described in detail. Ideas for future research are highlighted.

## **2. Short CV and personal impressions of the candidate**

Diana Starya was born on 08.05.1971. She graduated from the "Mathematical Sciences" specialty with a qualification as a mathematics teacher at the Faculty of Natural Sciences at the "Aleksandër Xhuvani" University of Elbasan in 1993 and in 2013 she received a Master's degree in the specialty "Applied Mathematics" from the same university. The candidate passed multiple qualification courses in the period from 1999 to 2022. Among them "Interactive learning", "Virtual learning in mathematics", "Blended learning, an innovative approach to teaching mathematics" and many others.

Diana Starja has extensive experience as a mathematics teacher in various schools in Albania. Since 2014, she has been a part-time teacher at the "Aleksandër Xhuvani" University of Elbasan, where she leads lectures and exercises. The candidate has numerous publications with a methodological focus, beyond those presented in the procedure.

I do not personally know the PhD student - Diana Staryya, but the provided works and methodological developments present her as a good professional and a skilled researcher, interested in improving the quality of education and the satisfaction of teachers and students in Albania.

### **3. Content analysis of the scientific and applied achievements of the candidate, contained in the presented PhD thesis and the publications to it, included in the procedure**

The topic of the dissertation work is current and pedagogically significant, given the natural course in the development of forms of education, forced by the pandemic situation in which the whole world has fallen. Researching the possibilities for personalization of mathematics education through the use of modern information technologies is useful and applicable.

Diana Staryya reaches a number of conclusions and recommendations based on a survey among 210 mathematics teachers from 4 regional directorates and 139 7th grade students.

The author elaborates 12 scientific and 12 scientific-applied contributions in her work. We will synthesize the given contributions, emphasizing the following *scientific* and *applied* contributions:

- Explored and compared with the UNESCO ICT Competence Framework for Teachers is the Normative Framework for Teacher Competences in Albania.
- The attitudes of Albanian teachers towards the application of ICT-tools in mathematics education have been studied through the author's toolkit.
- A methodology has been developed for training teachers to personalize mathematics education with the help of ICT.

The main *practical-applicable* ones can be synthesized as follows:

- Recommendations are formulated for educational policies (at school and university level) in Albania to intervene towards the implementation of ICT in education.
- Didactic materials were created, supporting the proposed model, applicable in a ready form in the teachers' practice.
- A toolkit was developed to study the attitude of students and teachers towards the application of ICT-means in mathematics education.

#### **4. Approbation of the results**

A total of 6 publications on the topic of the dissertation are attached to the dissertation, in two of which Diana Starja is the sole author, and in the others she is a co-author with one or two scientists, with equal co-authorship. The articles are in prestigious publications from Bulgaria and abroad. One of the articles - "IMPORTANCE OF LOGICAL-MATHEMATICAL ALGORITHMS IN SCHOOL MATHEMATICS", presented for the procedure, was published in co-authorship with Assoc. Prof. Dr. N. Nikolova in a Web of Science-referenced collection from the EDULEARN19 conference. The quantity and quality of the publications meets the requirements of the ADASRB and exceeds the necessary minimum laid down in the regulations for the application of the ADASRB.

I believe that the research in this dissertation is the personal work of the PhD student. The work shows the interest and the connection of the results with the current position of the author. A signed and certified report from an anti-plagiarism system check is submitted. I have not detected plagiarism in the materials submitted for review.

#### **5. Qualities of the abstract**

The abstract reflects the essence of the theoretical formulation, the conducted research, the obtained conclusions and contributions. The volume of the abstract is 34 pages, which allows the reader to quickly familiarize him/her-self with the ideas and contributions in the dissertation.

## 6. Critical notes, questions and recommendations

I would recommend the PhD student to synthesize her ideas, in order to improve the readability of the text in the future. Some technical errors are observed.

I have the following question for the PhD student:

- *Has it happened in your practice that you find that the application of a specific ICT-tool does not improve the quality of training?*

From the presented critical analysis and evaluation of the dissertation, it follows that there is an interesting and up-to-date research with practical and applied significance, which can be continued and deepened in the direction of the manifestation of the negatives in the application of ICT-means in education.

## 7. Conclusion

Having become acquainted with the PhD thesis presented in the procedure and the accompanying scientific papers and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, **I confirm** that the presented PhD thesis and the scientific publications to it, as well as the quality and originality of the results and achievements presented in them, meet the requirements of the ADAS in the Republic of Bulgaria, the Rules for its Implementation and the corresponding Rules at the Sofia University “St. Kliment Ohridski” (FMI-SU) for acquisition by the candidate of educational and scientific degree “Doctor”/the scientific degree “Doctor of Science” in the Scientific field 1. Pedagogical Sciences, Professional field: 1.3. Pedagogy of learning in ... In particular, the candidate meets the minimal national requirements in the professional field and no plagiarism has been detected in the scientific papers submitted for the competition.

Based on the above, **I strongly recommend** the scientific jury to award Diana Starja, the educational and scientific degree “Doctor” in the Scientific field 1. Pedagogical Sciences, Professional field: 1.3. Pedagogy of learning in ... (Teaching Methodology of Mathematics and Informatics).

Date: 14.01.2023

Reviewer: .....  
/ Prof. Nataliya Pavlova, D. Sc /

*\*ADASRB - Act on Development of the Academic Staff in the Republic of Bulgaria*