REVIEW

for defense of a dissertation procedure on a topic:

„METHODS AND TOOLS FOR SUPPORTING INQUIRY-BASED LEARNING"

for acquiring educational and scientific degree
"Doctor"
by

candidate: **Elitsa Vasileva Peltekova**

High Education Field: **4. Natural sciences, mathematics and informatics**

Professional Field: **4.6 Informatics and Computer Sciences**

Doctoral Program: „**Information Technologies (Information and Communication Technologies)**", department „**Information Technologies**"

Faculty of Mathematics and Informatics (FMI),

Sofia University "St. Kliment Ohridski" (SU),

The review is prepared by: **Assoc. Prof. Mariana Ilieva Atanasova, PhD** - from FMI at SU, as a member of the scientific jury, according to Order No. RD-38-307/1.07.2022 of the Rector of Sofia University.

1. General characteristics of the dissertation and the related materials

The dissertation of Elitsa Peltekova examines the possibilities of supporting schools to implement digital technologies in the teaching and learning processes, emphasizing the development of specific innovative teaching methods in STEM and planning, conducting,

evaluating and analyze numerous concrete scientific experiments on the application of these methods in practice.

The object, subject and research goals of the dissertation are clearly formulated. To achieve the main goal, 4 tasks are defined, each with two specific sub-tasks.

The dissertation is 184 pages, structured in an introduction, five chapters, a conclusion, 67 figures and 15 tables, 9 appendices, author reference for scientific publications and participation in scientific research projects and a bibliography of 148 literary sources, books, electronic sources, reports in English and Bulgarian.

In the introduction, the topicality of the problem is justified, a literature review is made, the object and subject of research are defined, the purpose, tasks and structure of the dissertation are presented. The first chapter examines the methods: research approach in teaching, scientific research in pedagogy (experiment, demonstration), collection of research data (surveys, interviews). In the second chapter there is an overview of the tools (technologies) used – mobile technologies, interactive whiteboards and virtual reality technology, which are part of the experiments and studies of the dissertation. In the third chapter, the studies carried out as work on the dissertation are described, regarding the applicability of the methods and means in Bulgaria. In the fourth chapter, a model of educational learning scenarios is proposed, which is based on a service-oriented architecture. The fifth chapter describes developed scenarios in STEM subjects ("Man and Nature", "Physics and Astronomy"), tested in experiments with PhD students and scientists from Sofia University. A validation of the scenarios was performed with practicing teachers. Challenges and conclusions are highlighted.

The presentation is clear, comprehensive and balanced. The dissertation work is well structured and appropriately illustrated.

2. Data and personal impressions about the candidate

Elitsa Peltekova was a part-time doctoral student at the Department of "Information Technologies" at FMI at SU since 2014. She has been granted the right to defense by order No. RD 20-9/30.01.2019. She has professional experience as: information security expert, sector "Electronic and distance learning" from 2018 until now; expert programs and projects under the project "Social innovations for digital skills in the changing labor market"; lecturer in training seminars at RAABE Bulgaria since 2013; first level researcher at FMI of SU from 2019. She has a master's degree in e-learning, 2009-2011, from Sofia

University "St. Kliment Ohridski", and bachelor's degree in applied mathematics, 2005-2009, from Technical University - Sofia. She was an Erasmus student (at the Free University of Brussels, Belgium in 2008). And during her doctoral studies, he was a student under the Erasmus+ program at the Faculty of Applied Mathematics and Informatics of the Warsaw University of Natural Sciences, Poland. She participated in numerous international and national research projects.

I have known Elitsa Peltekova personally since 2017. We are colleagues in the Department of Information Technologies of FMI at SU. And we have also worked together in a number of scientific projects. I am impressed by her hard work and her diverse talents - she does an excellent job in both research and administrative and managerial work, as well as teaching. She treats each task with extreme responsibility, pays attention to details, and at the same time is attentive to the people in the team she works with.

3. Content analysis of the candidate's scientific and applied achievements, contained in the submitted dissertation and the publications to it, included in the procedure

The main scientific contributions in the dissertation can be formulated as follows:

Scientific contributions

1) Modern technological means applicable in STEM education are analyzed.
2) Selection criteria are defined according to the context of research training.
3) The possibilities and attitudes towards the application of modern technological means in education have been researched and analyzed, and concrete steps have been taken to direct them in a positive direction.
4) The advantages and limitations of the application of technological means in the teaching of natural sciences are presented.
5) Factors influencing the increase in the interest, motivation and results of the learners have been identified.

Applied contributions

1) A system model for educational scenarios is proposed, which is based on a service-oriented architecture.
2) Mock-ups have been created for the application of the system in the detection of scenarios, according to the methods, means and context of their application.

3) Sample educational scenarios were developed – a sample research learning scenario to define the phases of the process, a sample technology-assisted research learning scenario and several example applications of the latter.

4) It has been experimentally established that the created samples of educational scenarios lead to an increase in interest and results in science education.

The achieved scientific and applied results are an important step in finding an adequate approach to the use of technologies in education, so that they positively affect both the process of learning the material and the motivation and interest of the students.

4. Approbation of the results

All the main results of the dissertation are published in publications, of which 5 are indexed in Scopus, and 2 - with an impact factor. The PhD student is a co-author of all publications and there is no doubt about her contribution to the publications. At present, 16 citations of these publications are known. They testify to the value and authenticity of the research.

The scientific works meet the minimum national requirements (under Article 2b, Paragraphs 2 and 3 of the RSARB) and, accordingly, the additional requirements of SU "St. Kliment Ohridski" for the acquisition of an educational and scientific degree "doctor" in the scientific field and professional direction of the procedure.

The results presented by the candidate in the dissertation work and related scientific works do not repeat those from previous procedures for acquiring a scientific title and academic position.

There is no proven plagiarism in the submitted dissertation and scientific works under this procedure.

5. Quality of dissertation's abstract

The abstract has been prepared in accordance with the requirements of the Regulations of FMI - SU for the terms and conditions for acquiring scientific degrees and occupying scientific positions. The abstract fully, comprehensively and accurately reflects the content of the dissertation, as well as the main scientific and applied achievements.

6. Critical remarks and recommendations

I have no significant notes or recommendations.

But I have two questions.

1) Can we derive a conclusion which technologies are most applicable in education 1) from the point of view of effectiveness, and 2) of ease of use?

2) In point 2.1.2, a study conducted in 8 countries is discussed that concerns the use of tablet devices to improve teaching and learning practices. Are there good practices identified in the use of these technologies and with what applications have they been adopted? Are there established approaches how to teaching students to deal with distractions using technologies and internet?

7. Conclusion

Having familiarized myself with the dissertation work presented in the procedure and the scientific works accompanying it and based on the analysis of their significance and the scientific and applied contributions contained in them, I **confirm that the presented dissertation** work and the scientific publications to it, as well as the quality and the originality of the results and achievements presented in them, **meet the requirements** of ZRASRB, the Regulations for its application and the relevant Regulations of SU "St. Kliment Ohridski" for the candidate's acquisition of the educational and scientific degree "doctor" in the scientific field 4. Natural sciences, mathematics and informatics and professional field 4.6 Informatics and computer sciences. In particular, the candidate satisfies the minimum national requirements in the professional direction and no plagiarism has been found in the scientific works submitted for the competition.

Based on the above, I **recommend** to the respected scientific jury **to award to Elitsa Vasileva Peltekova the educational and scientific degree "Doctor"** in professional field 4.6 Informatics and computer sciences (Information technologies).

15.09.2022 г.   Reviewer: