O P I N I O N

by Assoc. Prof. Eng. Diana Velkova Stoyanova, PhD – Plovdiv University „Paisii Hilendarski”

on the doctoral thesis for acquiring the educational and scientific degree "Doctor"
in: field of higher education 5. Technical Sciences
professional area 5.3. Communication and Computer Engineering
doctoral program "Automation of areas of the non-material sphere (medicine, education, science, administrative activity, etc.)"

Author: Tsvetelina Lachezarova Ivanova-Varadinova

Topic: System of technology-based decisions in engineering education

Supervisor: Assoc. Prof. Nadezhda Miteva Kafadarova, PhD - Plovdiv University „Paisii Hilendarski”

1. General presentation of the procedure and the doctoral student

Based on the order of the Rector of Plovdiv University “Paisii Hilendarski” РД-21-719 from 02.04.2024, I have been appointed as a member of the scientific jury to ensure the procedure for defending the doctoral thesis on the topic "System of technology-based decisions in engineering education" for the acquisition of the educational and scientific degree "Doctor" in the field of higher education 5.Technical Sciences, professional area 5.3. Communication and Computer Engineering, doctoral program "Automation of areas of the non-material sphere (medicine, education, science, administrative activity, etc.)". The author of the dissertation is Tsvetelina Lachezarova Ivanova-Varadinova – a full-time doctoral student at the Department of ECIT (Electronics, Communications, and Information Technologies) with a supervisor Assoc. Prof. Eng. Nadezhda Miteva Kafadarova, PhD, from PU "Paisii Hilendarski".

The set of materials presented by the doctoral student complies with Article 36 (1) of the Regulations for the Development of the Academic Staff of PU and includes the following documents:

- Application to the Rector of PU to initiate the procedure for defending the doctoral thesis;
- CV in European format;
- Minutes of the Department Council related to the readiness for initiating the procedure and the preliminary discussion of the doctoral thesis;
- Doctoral thesis;
- Author`s Summary in Bulgarian and English language;
- List and copies of the scientific publications on the topic of the dissertation -8 publications;
- A reference to compliance with the minimum national requirements;

- Declaration of the originality and authenticity of the attached documents.

Tsvetelina Lachezarova Ivanova-Varadinova completed her secondary education at the Humanitarian High School "St. St. Cyril and Methodius" in Plovdiv in 2012. After that, she continued her studies at Plovdiv University "Paisii Hilendarski", where she earned her bachelor's and master's degrees. In 2016, she began her employment at "Stib Control" EOOD. In 2017, she started her job as an "Organizational Service" expert at the University of Plovdiv. From 2020 until now, she has been working as an assistant at the Faculty of Physics and Technology in Plovdiv University "Paisii Hilendarski", at the Department of Educational Technologies.

I personally know Tsvetelina Lachezarova Ivanova-Varadinova, and I have an excellent impression of her as a teacher and researcher.

2. Relevance of the topic

The digital transformation of society has led to new demands on the labour market, individual competencies, and skills of the workforce. Engineering education is also subject to digital transformation and requires a change in learning models driven by technological innovation. To acquire new skills, future engineers need to use two main groups of educational technologies: active learning technologies (problem-based and project-based learning, etc.) and e-learning technologies (virtual laboratories, augmented reality, gamification, etc.). That is why I consider the topic of the developed dissertation work to be particularly relevant. The research is related to developing, updating, implementing, and researching a technology-based learning model for laboratory exercises in engineering disciplines, which includes learning through simulations and remote access to laboratory equipment.

3. Understanding the problem

The literature review includes 91 publications, 40% of which were published within the last decade, indicating a comprehensive analysis of the current state of the issue. Most of the publications are in English - 79 publications.

4. Research methodology

At the end of the first chapter, the dissertation's research purpose and tasks are stated. The chosen research methodology corresponds to the set purpose. It comprises: a review of literature on technology-based methods in education and a study of previous experience of using innovative technologies in the Faculty of Physics and Technology; development of a model of technology-based training for laboratory exercises in engineering disciplines, which includes training through simulations and training through remote access to laboratory equipment; development of laboratory exercises in the discipline "Electronics" for testing the model; development of a methodology for carrying out these exercises in three forms of training: face-to-face training; distance learning with simula-

tions; training with remote access to laboratory equipment; construction of a system for remote access to laboratory equipment used in the laboratory exercises in Electronics; conduct of pedagogical research and analysis of the obtained results.

5. Characterization and evaluation of the dissertation and its contributions

The total volume of the dissertation is 165 standard pages. It includes: an introduction, four chapters, a description of contributions, a declaration of originality of results and contributions in the dissertation, a list of publications of the doctoral student, and a literature review. The appendixes are structured in 3 parts with a total volume of 64 pages. The presented dissertation has scientific-applicative value. The following scientific-applicative and applicative contributions have been made:

1. An overview of technology-based teaching methods, as well as various technologies and software tools that are integrated into the educational process, has been made.

2. A model of technology-based training for laboratory exercises in engineering disciplines has been developed, which includes training through simulations and training through remote access to laboratory equipment.

3. Laboratory exercises were developed in the discipline "Electronics".

4. A methodology is proposed for conducting these exercises in the three forms of training: face-to-face training; distance learning with simulations and remote access to laboratory equipment.

5. A VPN using the WireGuard protocol was established for the experiments with remote access to the prototypes of constructed laboratory circuits.

6. An experiment was conducted to evaluate the proposed model, which includes conducting laboratory exercises in three forms of training: face-to-face training; distance learning with simulations and remote access to laboratory equipment.

6. Evaluation of publications and the doctoral student's personal contribution

The doctoral student, Tsvetelina Lachezarova Ivanova-Varadinova, presented eight publications related to the subject of her dissertation work, all in English. She is the sole author of two publications, while the remaining six are co-authored. In five of the co-authored publications, she is the first author. This undoubtedly shows the importance of her contribution. There is no information to cite any of the articles.

Tsvetelina Lachezarova Ivanova-Varadinova achieved 85.1 points out of the minimum required 30 through these scientific publications. This leads me to conclude that the necessary publicity for the research in her dissertation work has been secured.

7. Author’s summary

The Author’s summary is presented in Bulgarian and English. It comprises 32 pages, including

contributions and publications related to the dissertation. The Author's summary faithfully reflects the content of the dissertation in a shorter form.

8. Recommendations for Future Use of Dissertation Contributions and Results

In my opinion the dissertation would have a more complete look if there was a conclusion in which the doctoral student would present generalized conclusions from the research.

I have the following remark about the dissertation work: there is a significant imbalance in the volume of individual chapters. The indicated critical remarks in no way detract from the achievements of the developed dissertation work.

CONCLUSION

The dissertation contains contributions of scientific-applied and applied nature, that represent an original contribution to science and meet all the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law on the Development of Academic Staff in the Republic of Bulgaria and the corresponding Regulations of Plovdiv University "Paisii Hilendarski".

The presented dissertation demonstrates that the doctoral student Tsvetelina Lachezarova Ivanova-Varadinova possesses theoretical knowledge and professional skills in the scientific specialty "Automation of areas of the non-material sphere (medicine, education, science, administrative activity, etc.)", showing qualities and abilities for independent scientific research.

Due to the above, I confidently give my positive assessment of the conducted research, represented by the developed dissertation, author's summary, achieved results, and contributions, and I propose to the honourable scientific jury to award the educational and scientific degree "Doctor" to Tsvetelina Lachezarova Ivanova-Varadinova in the field of higher education: 5. Technical Sciences, professional area 5.3. Communication and Computer Engineering, doctoral program "Automation of areas of the non-material sphere (medicine, education, science, administrative activity, etc.)".

10.05.2024 г. **Author of the opinion**: .....

/Assoc. Prof . Diana Stoyanova/