

# Opinion

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on Dissertation for the award of the educational and scientific degree "doctor"

in the field of higher education	1. Pedagogical sciences
professional direction	1.3. Pedagogy of training in ...
doctoral program	Methodology of training in informatics and information technologies
Author	Muharem Asanov Mollov
Topic	"Methodical approach for the application of competence-based training in the profession of "Applied programmer""
Supervisor	Assoc. professor Dr. Gencho Dimitrov Stoitsov

## 1. General presentation of the procedure

By order RD-21-435/24.02.2023 of the rector of Plovdiv University "Paisii Hilendarski" I have been appointed as a member of a scientific jury to ensure the procedure for the defense of a dissertation work on the topic "Methodical approach for the application of competence-based training by profession "Applied programmer"" for acquiring the educational and scientific degree "doctor" in the field of higher education 1. Pedagogical sciences; professional direction: 1.3. Pedagogy of training in ...; doctoral program Methodology of training in informatics and information technologies.

I was provided with a set of documents for the procedure, which contains 11 main documents: dissertation work, abstract in Bulgarian and in English, a list and copies of 8 publications related to the dissertation, doctoral documents (protocols of meetings of the departmental council, declaration of originality, reference minimum requirements, service notes, etc.), professional resume, etc. I evaluate this set of documents as complying with the requirements of the Law for the academic development, the Regulations for its implementation and the Regulations for the development of the academic staff of Plovdiv University "Paisii Hilendarski".

At an extended meeting on 21.11.2022 of the Department "Education in Mathematics, Informatics and Information Technologies" at the FMI of the PU, the doctoral student Mollov's dissertation work was discussed and directed for defense after reflecting on the remarks made. At the next meeting on 21.01.2023, the department council finally admits the dissertation to defense before a scientific jury. The procedure for the defense of the ONS "Doctor" is organized in accordance with the law, and the submitted Dissertation work and abstract (in Bulgarian and English) meet the requirements of the Regulations on the terms and conditions for acquiring scientific degrees and holding academic positions at the Plovdiv university.

## 2. Data on the PhD candidate

Doctoral student Muharem Asanov Mollov has many years of experience as a teacher of mathematics and informatics, having acquired the relevant educational and professional qualification degrees at the Plovdiv University "Paisii Hilendarski", where he has been a doctoral student since 2019. Obviously, his interest in these scientific fields was born as early as Mathematic gimnazium "Vasil Levski", Smolyan. He is also studying Marketing and Management at the same university, which would also be useful for a teacher.

### **3. Dissertation characteristics and assessment**

#### **3.1. Common feature**

The topic of the dissertation is developed in a total volume of 168 pages, which include 131 pages of main text, 12 pages of used literature, 4 pages of Internet sources and additional pages with 3 appendices, contributions, development prospects, statement, acknowledgments. The structure of an introduction, three chapters, a conclusion, used literature from 184 sources in Bulgarian and English, 47 Internet sources, three appendices, a list of 8 publications and 2 reports presented at conferences, a list of 11 citations of 9 of the publications and a declaration for originality of results and contributions. Visualization in the main content is realized through included 18 figures, 6 diagrams with results, as well as 35 tables. The applications contain an entry-level test, solving tasks to learn object-oriented and functional programming style. The general characteristic defines the dissertation work as a serious and sufficient volume of development with well-publicized results.

#### **3.2. Relevance of the topic**

I assess the topic of the dissertation work as relevant, due to its connection with the need to organize and implement quality training for mastering the "Applied Programmer" profession, which is important for our modern society. In the presented programming learning experiment, a competence approach belonging to the innovative approaches in informatics education is applied. This implies providing a higher level of mastery of programming as an activity, where the in-depth learning of programming techniques is important, building one's own style and ensuring the efficiency of the software creation process. Furthermore, the application of the competency approach to programming education in the secondary school is under-researched.

#### **3.3. Analysis of the content of the dissertation work**

The dissertation aims to develop and approve a methodological approach for competency-based training of students in the profession of "Applied Programmer", which implies the creation of a suitable toolkit for developing professional knowledge, skills and attitudes for software development. The goal also includes diagnostics of the programming competencies included in the curriculum.

#### **Aim, object, subject, hypothesis and methods**

The purpose is clearly defined and supported by equally clear and specific tasks, which reinforces the character of the dissertation research. The expectation is that the implementation of the three logically consecutive tasks will lead to the realization of the objectives. Task 2 directly reveals what the essence of the methodological approach will consist of and defines a special role of a set of tasks for developing professional competences. The object, subject and hypothesis of the study are formulated in accordance with the other elements of the study. I accept the research methods as sufficient and well defined.

#### **First chapter**

It presents the theoretical study of the relevant field, leads to an analysis of the essence and application of competence-based learning and education in the world and in our country and highlights its connection with constructivism as an active cognitive method. A good conclusion is the generalized definitions of competence and competency, the review of the typology of competences, competence models, as well as the transition to competence-based learning, as a modern form of constructivism. At the end of the theoretical analysis, after a review of competency frameworks directly related to software engineering professions, the doctoral student presents a resulting framework with cluster competencies that apply to the "Applied Programmer" profession.

The conclusion follows from the content of the first chapter that the doctoral student has thoroughly studied all aspects of the topic he is developing. He shows the ability to draw conclusions, form his own view on the problems and situations under consideration, as well as create his own formulations, conclusions and ideas for solving the problem under consideration in concrete terms.

#### **Second chapter**

The chapter is dedicated to the theoretical basis and construction of a methodical approach for the application of KBO on PPP, for the successful formation and development of basic (key) and

professional (specific) competences of students. A technological educational model for the implementation of the methodological approach, considered as a spiral, a ladder and a cycle, is formulated here. The model relies on the involvement of business, the implementation of standards, understanding learning and the role of educators in a new way, placing the learner at the center of the learning process and a thorough analysis of the advantages of collaborative blended distance learning in an electronic environment. It is based on the design of the educational content at the level of State educational standards (DOS), Module and study unit, as well as on selected means and tools for assessing the individual levels. A framework with requirements for the types of tasks, a methodology for creating a set of tasks and a corresponding teaching methodology based on it is presented. An essential part of the methodology is the determination of target learning outcomes, a set of tasks for project-based learning and for a specific program module. The methodology is completed in section fourth, where tasks for knowledge, skills and competences are skillfully formulated. There are also the specific forms of assessment for competency-based learning. In the chapter there are enough tables and diagrams that illustrate and facilitate the perception of the methodology proposed by the doctoral student.

### **Third chapter**

This chapter presents a pedagogical experiment that tests the hypothesis of the dissertation work. This defines the present study as methodologically sound and implemented at a high scientific level. The experiment is planned and organized very competently with clear methodology, goals, working hypothesis, learning objectives and tasks for each of the planned three stages. Over 200 students from different schools are covered - a good indication of its reach. The statistical verification of the reliability of the results was carried out flawlessly with appropriate methods and proves that the applied methodological approach is successful.

### **Conclusion**

The author of the dissertation has proposed a valuable conclusion in which he accurately and clearly summarizes the results and achievements of his work in a theoretical and practical aspect. Adequate conclusions have been drawn and prospects for future development of the developed methodological approach have been identified. Approving part of the results into projects is also a good achievement.

### **4. Contributions**

According to the characteristics mentioned above, we can define the dissertation work as scientific, scientific-applied and applied.

I accept the scientific contributions proposed by the doctoral student, related to the created methodological approach for the application of competence-based training in the profession of "Applied programmer". I agree with its innovative features.

Dissertation research is valuable for the methodological approach to learning created and applied, and for the fact that the student is at the center of it.

The abstract meets the requirements, reflects the content and contributions of the dissertation work.

### **5. Publications and participation in scientific forums**

The author's publications on the dissertation count 8 journal articles and two conference reports. An excellent result is that six of the articles are in Web of Science and 9 of the publications are cited 11 times - 4 in foreign and 7 in Bulgarian articles. There are publications in Bulgarian and in English, which ensures a good promotion of the results in the country and abroad.

Three of the PhD student's publications are independent, which confirms his independent position. The rest of the articles are co-authored, with six being the first author. This is a testament to his ability to work in a team and take responsibility. The doctoral student's contribution to the publications is indisputable.

In my opinion, the number and quality of the publications meet the requirements of the Regulations on the terms and conditions for acquiring scientific degrees and for holding academic positions at the PU. Their content presents key results to a specialized scientific audience.

#### **6. Opinions, recommendations and notes**

I approve of the structure of each chapter of the dissertation, where a summary of the content is offered at the beginning, and conclusions and a conclusion are offered at the end of the chapter. Together with good written language, this forms a good scientific style of the work.

But I found most of the abbreviations used in the text to be strange and very confusing.

The conducted research work and experiments characterize Muharem Asanov Mollov as a dedicated and excellent programming teacher who dedicated his scientific work to the enrichment of educational technologies. I believe in the future use and development of his dissertation results, despite the very realistic prospects formulated by the PhD student.

#### **7. Conclusion**

The dissertation with author Muharem Asanov Mollov meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for its implementation and the Regulations of PU "Paisiy Hilendarski" for scientific degrees and academic positions. Scientific, scientific and applied contributions are available, results are well disseminated and prospects for future development are clearly outlined.

The doctoral student demonstrates theoretical knowledge and professional skills for independent conduct of successful scientific work, masters and applies modern scientific research methods.

I confidently express my overall positive assessment of the conducted dissertation research and the presentation of the doctoral student in the current procedure.

With my positive opinion, I propose to the honorable scientific jury to award Muharem Asanov Mollov the educational and scientific degree "doctor" in the field of higher education 1. Pedagogical sciences; Professional direction: 1.3. Pedagogy of training in ...; doctoral program Methodology of training in informatics and information technologies.

18.04.2023

Prepared the opinion: .....

(prof. Lina Jordanova, PhD)