REVIEW

by Associate Professor Gabriela Georgieva Kiryakova, PhD
Trakia University – Stara Zagora
on the dissertation for acquiring the educational and scientific degree "Doctor"

Topic:	Methodical approach for the application of competence-based training in the profession "Applied programmer"
PhD Student:	Muharem Asanov Mollov
Mentor:	Assoc Prof. Dr. Gencho Dimitrov Stoitsov
Area of higher education:	1. Pedagogical sciences
Professional field:	1.3. Pedagogy of training in ...
Doctoral program:	Methodology of training in informatics and information technologies

The review is prepared on the basis of Order № РД-21-439/24.02.2023 by the Rector of University of Plovdiv "Paisii Hilendarski".

1. General description of the submitted materials

The submitted set of materials by Muharem Mollov includes:
- Application form to the Rector of the University of Plovdiv "Paisii Hilendarski" for initiating a procedure;
- CV;
- Protocol of the preliminary discussion in the department;
- Abstract – in Bulgarian and English;
- Declaration of originality and authenticity of the attached documents;
- Reference for compliance with the minimum national requirements;
- List of publications;
- PhD thesis;
- Copies of the publications on the topic of PhD thesis;
- Official notes.

The set of materials is in accordance with the requirements of the of Law for the development of the academic staff in Republic of Bulgaria as well as the Regulations for development of the academic staff of the University of Plovdiv "Paisii Hilendarski".

2. Brief biographical data of the PhD student

Muharem Asanov Mollov has graduated from the University of Plovdiv "Paisii Hilendarski" with the acquired qualification Mathematician with a specialization in Informatics, a teacher of Mathematics and Informatics, as well as a specialization in Marketing and Management.

He has been working as a Mathematics and Informatics teacher at Secondary School "Hristo Botev" in the village of Chepintsi for over 25 years.

Muharem Mollov participates as a teacher in the National program "Training for IT skills and career". He is part of the team of scientific research projects financed by the Scientific Research Fund at University of Plovdiv "Paisii Hilendarski". He participated in over 20 short-term and long-term qualification courses, seminars and trainings.

3. General characteristics of the PhD thesis

3.1. Relevance of the topic

The dynamic development of the IT sector imposes new requirements on the qualifications of candidates for positions in it. Good educational practices show that training should be aimed at developing the basic and professional competencies of the future specialists.

The successful application of a competence-based approach in the training of professions from the IT sector in secondary vocational education can contribute to the formation of key competences in learners, including the necessary professional competences for software development. Of particular importance is the availability of methodological tools for its application in training.

In this context, the theme of PhD thesis is relevant and is connected to topical issues about competence-based training and the formation of the necessary knowledge, skills and competences for the IT sector.

3.2. Knowing the problem

Muharem Mollov demonstrates in-depth knowledge in the field of the PhD topic and presents his vision for the existing problems and their solution.

The PhD student makes a thorough theoretical analysis of the scientific literature on issues related to competence-based training, methods and approaches for implementing the constructivist theory. The reasoning is in the direction of applying the competence approach in the selection of personnel in IT industry, the transition to competence-based training, the existing competence models, profiles and frameworks related to the profession of "Applied Programmer".

The in-depth analyzes combined with the methodical approach and didactic training materials proposed by Muharem Mollov are proof of his knowledge of the state of the research problem at the theoretical, methodological and applied level.

3.3. Analytical characteristics of the research work

The PhD thesis is structured in the following parts: an introduction, three chapters and a conclusion. There is a list of scientific contributions and prospects for development, as well as a list of literature sources. Appendices and publications on the subject are included to the PhD thesis.

In the **Introduction**, Muharem Mollov substantiates his motivation for choosing the research problem and the grounds for the conducted study. He outlines the purpose of the research – development and approbation of a methodological approach

for competency-based training of students in the profession of "Applied Programmer", including a suitable toolkit for developing and diagnosing the professional competencies in software development included in the curriculum (page 10). To achieve the purpose of the study, several research tasks have been defined. The object and subject of study are indicated, the research hypothesis is formulated, as well as the methods used to achieve the goal.

In **Chapter One**, the author presents the global and European trends in computer science education, the results of conducted studies in this area and makes a review of different educational practices. He discusses the scientific-theoretical statements of the philosophy of constructivism, the approaches and methods for implementing constructivist education.

In his work, Muharem Mollov presents the main ideas in the competence approach, deriving working definitions of a competency and a competence, summarizing the typology of competencies and paying attention to competency models and profiles. The PhD student explains the transition to competency-based learning, comparing it to the traditional context-based knowledge pedagogy.

The author emphases on the competency frameworks and normative documents related to the profession "Applied programmer". He forms an integrated result framework after the selection and synthesis of the competences of the listed frameworks. The purpose of the framework is to define the objectives of the training and to realize an appropriate methodological approach based on the principles of competency-based training in the profession of "Applied Programmer" to develop professional competencies.

In **Chapter Two** Muharem Mollov presents the theoretical basis and concept of the methodological approach he has developed for competence-based training in the profession of "Applied programmer" using a partial modification of the classic ADDIE training model. He introduces and clarifies in a logical sequence the main concepts which are used in the research: training, training approach, model, training method and technology of training.

Muharem Mollov offers a technological educational model for the implementation of the methodical approach, developed by him. The model proposes innovations in teaching and assessment, as well as their organization in a mixed environment with more than one teacher.

The PhD student examines the didactic tools used in developing the learning content. He creates a Task Types Requirement Framework. The tasks are divided into 3 main groups: for acquiring knowledge; for acquiring skills; for formation and development of competences. Muharem Mollov offers a methodology for creating a set of tasks that is consistent with the study plans and curricula of the various modules. The methodology allows a consistent and spiral upgrade of knowledge, skills and competences and guarantees their consolidation and durability. A teaching methodology has been created through a set of tasks for the development of professional competences laid down in the National Educational Standards for the profession "Applied Programmer". The PhD student presents sets of tasks that he had

used in his experiment. He discusses the proposed model for Collaborative Blended Distance Trainning in an Electronic Environment.

In **Chapter Three**, the organization and the steps of the pedagogical research are presented and the obtained results are discussed. Muharem Mollov describes the purpose, the working hypotheses and the methodology in detail.

His study is divided into three stages: a two-time examination of the professional competence on Algorithms and data structures, self-assessment and expert assessment of the trainees' competence.

The purpose of the first stage is to compare the results of applying two different approaches – a methodological approach for competence-based training and the traditional training approach applied in vocational high schools of the "Applied Programmer" profession. The collected data are processed with SPSS, and statistical hypothesis testing was performed using the Mann-Whitney test. The analysis proves the author's working hypothesis that through the application his methodological approach in the selected modules for the "Applied Programmer" profession training, a higher degree of assimilation of knowledge and skills is achieved, as well as specific competences in the profession are more successfully formed compared to traditional context-based learning.

The second stage involves surveying the learners' self-assessment. The goal is to determine the level of self-assessment of learners for developed specific competencies based on the applied methodological approach and to compare it to the level of self-assessment for the same competencies of learners using the traditional approach. Muharem Mollov uses Google Forms to create questionnaire. The results are summarized and presented in frequency tables and visualized graphically. Statistical tests confirm the working hypothesis of higher levels of self-assessment in the experimental group (the one with an applied methodological approach for competence-based training).

The third stage includes an expert assessment, which is carried out through a developed competency assessment card. The outcomes are presented in frequency tables and visualized graphically. The results of the statistical tests show that there is a statistically significant difference in level of learners' competences in favor of the experimental group (the one with an applied methodological approach for competence-based training).

In **Conclusion**, Muharem Mollov summarizes the usefulness of proposed methodological approach for competence-based training in terms of the students' achievements and the organization of the learning process.

3.4. Literature references

Muharem Mollov has studied a significant volume of information sources of a diverse nature. The bibliography includes 184 literary sources – 77 are in Cyrillic and 107 in Latin. Internet sources are 47 – 21 in Cyrillic and 26 in Latin.

4. Scientific contributions

The main scientific and applied contributions of the research are precisely formulated by the author and are sufficient for obtaining the educational and scientific degree "doctor":

- A methodical approach for competence-based training in the profession of "Applied Programmer" in secondary vocational education has been proposed and tested. The approach is based on the ADDIE model with appropriately created sets of tasks for the development of competencies and a proposed methodology for their creation and use.
- An adaptation of the learning environment was proposed and approved, allowing mixed synchronous and asynchronous learning on site and in an electronic environment, teaching by a team of teachers and collaborative distance learning in an electronic environment of more than one group.
- A methodological toolkit has been developed and tested for: diagnosis and assessment of the level of professional competences acquired by learners; self-assessment of professional and basic competencies of learners; expert assessment by specialists.

The relationships between the contributions, the tasks of the research and the publications related to its topic are summarized in a table.

5. Abstract and publications on the topic of the PhD thesis

Muharem Mollov has presented 8 publications on the topic of the PhD thesis, 6 of them are indexed in Web of Science, 2 were reported at a scientific conference. The ideas in some of them directly correspond to the topic of the study. The results of the research have been published in scientific papers and are available to the general public. 11 citations of the publications are indicated, 4 of them are in foreign and 7 in Bulgarian papers.

The abstract has a volume of 32 pages and sufficiently reflects the essence and the content of the PhD thesis and the main results achieved in the research.

6. Critical Remarks

I have no critical remarks about the materials submitted for the review.

7. Conclusion

The PhD thesis of Muharem Asanov Mollov meets the requirements of the Law for the development of the academic staff in the Republic of Bulgaria, the Regulations for the development of the academic staff of the University of Plovdiv "Paisii Hilendarski" and the specific requirements of the Faculty of Mathematics and Informatics for the acquisition of the educational and scientific degree "doctor".

The topic of the research is relevant, the goals and objectives have been achieved, and the defined hypothesis has been proven through a pedagogical experiment. The research shows that the PhD student Muharem Mollov possesses in-depth theoretical knowledge and demonstrates skills for conducting qualitative research.

Considering all the above-mentioned, I give my positive assessment of the conducted research, presented by the reviewed PhD thesis, abstract, achieved results and contributions. I propose to the honorable Scientific Jury to award the educational and scientific degree "doctor" to Muharem Asanov Mollov in the area of higher education: 1. Pedagogical sciences, professional field 1.3. Pedagogy of teaching in ..., doctoral program Methodology of teaching in informatics and information technologies.

10.04.2023   Member of the Scientific Jury:
                                                  /Assoc. Prof. Gabriela Kiryakova, PhD/