R E V I E W

by Prof. Georgi Petrov Dimitrov PhD

of the materials submitted for participation in the selection process for the academic position "Professor" in the higher education field 4. Natural Sciences, Mathematics and Computer Science Professional field 4.6 Informatics and Computer Sciences (Informatics), announced in the State Newspaper no. 99, 20.11.2020 by Plovdiv University "Paisii Hilendarski"

By order of the Rector of Plovdiv University "Paisii Hilendarski" No.R33-74 from date 21.01.2021 I have been appointed a member of the Scientific Jury for conducting a competition for "Professor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics; professional field 4.6. Informatics and Computer Science (Informatics), announced in State Gazette, issue 99 from 20.11.2020. Documents for participation in the competition were submitted by one candidate – Assoc. Prof. Elena Petrova Somova, PhD, from Department of "Computer Informatics" at the Faculty of Mathematics and Informatics (FMI). With Protocol No.1 from 12.16.2020 at a meeting of the Scientific Jury of the competition I was chosen as a reviewer of this application. This document presents my review.

1. General description of the submitted materials

As a member of the jury I received the following documents:

1. CV in European format;
2. Diploma for higher education at the educational-qualification degree "Master";
3. Diploma for educational and scientific degree "Doctor";
4. Diploma for Associate Professor;
5. Sertificate for work expiriense;
6. List of all scientific papers of the candidate and copies of those for participation in the competition, incl. a list of citations?
7. References for observance of the minimum national requirements and of the additional requirements of FMI at PU, according to art. 65. (3) of PRASPU:
8. Annotations of the materials, including self-assessment of contributions (in Bulgarian and English);
9. Documents for educational work – a reference for classroom and extracurricular activities, work with students and graduates, and a list of published educational materials;
10. Documents for research work:
11. set of documents on paper;
12. set of documents on electronic carrier.
13. All submitted documents are designed and described thoroughly, in detail and very carefully.

Assoc. Professor Assoc. Prof. Elena Petrova Somova, PhD is co-author in more then 75 scientific publications. The papers with which the candidate participates in the competition for Professor are 45 in total and include 39 scientific papers, 1 book and 5 separate chapters of monographs. 11 of them are referred to in SCOPUS, Web of Science (WoS) database ACM or IEEE Explorer.

Elena Somova has gained serious research experience from participation in 25 international projects (8 in the last 5 years) - manager of 8 international projects in the last 5 years. Participation in 10 national projects, 3 of which in the last 5 years.

I acknowledge the receipt of the publications submitted for participation in the competition to be reviewed.

2. Details of the candidate

From 1996 until now Assoc. Prof. Elena Petrova Somova has been working at Plovdiv University " Paisii Hilendarski", passing successively through the positions - Assistant (1996-1999), Senior Assistant (1999-2002), Chief Assistant (2002-2007), Associate Professor (2007- present).

Since 2012 she has been the Head of the Department of Computer Informatics, FMI, Plovdiv University "Paisii Hilendarski"

3. Analysis of the scientific and scientific-applied achievements of the candidate

In the FMI of PU, Assoc. Prof. Dr. Elena Petrova Somova has prepared and led lectures in the following disciplines: "Logical and functional programming", "Programming", "Algorithms and data structures", "Object-oriented programming"," Web programming "," Programming languages "," Introduction to computer science "," Business process modeling and management "," Multithreaded programming in C # "," Object-oriented programming in C # "," Logical and functional programming "," Information technologies in education "," Design of e-learning content "," Modern information technologies in education ", etc ..

Assoc. Prof. Dr. Elena Petrova Somova appears as a highly competent and demanding teacher, applying new technologies in education. Actively works with doctoral students and graduates. She is a research supervisor of one successfully defended doctoral dissertation and a large number of defended diploma theses.

Evaluation of the scientific and applied science activity of the candidate

Assoc. Prof. Elena Petrova Somova PhD has a diverse scientific and applied research activity, which can be seen from the total number of her publications - 75. The papers with which the candidate participates in the competition for Professor are 45 in total and include 39 scientific papers, 1 book and 5 separate chapters of monographs. 11 of them are referred to in SCOPUS, Web of Science (WoS) database ACM or IEEE Explorer.

The presented materials do not repeat others used in previous procedures for obtaining the educational and scientific degree "Doctor" and for holding the academic positions "Chief Assistant" and "Associate Professor".

The scientific papers can be classified in the following scientific fields:

- Technologies, models and systems for e-learning – 18 scientific publications and 3 monographs;
- Models and systems for gamification of education – 7 scientific publications;
- Mobile learning technologies – 7 scientific publications;
- Automated generation of metadata for digital documents and artifacts – 7 scientific publications and 2 monographs;
- Textbooks – 1 textbook.

All publications are co-authored.

Accepting the statements in the author's annotation , I would summarize the candidate's contributions in groups, as presented below:

The monographs exhibit [9, 21, 22] a systematic approach to present the field of e-learning and distance learning.

Monograph [9] addresses the following topics: education in the information society, models and systems for e-learning, e-learning for people with special educational needs, standards in e-learning, tests and systems for e-testing and assessment of the quality of learning. Personal contributions are in Chapters 1, 2 and 5, mainly in presenting the forms of learning in the information society,

distance learning, the historical development of new forms of learning, models in e-learning, automated e-learning tools, e-learning environments, virtual universities, test modeling and the test system of PeU 2.0.

Monograph [21] addresses the following topics: education in the information society, models and systems for e-learning, contemporary trends in e-learning, special education and e-learning, standards in e-learning, the test in e-learning, methodology of e-learning and free software in e-learning. Personal contributions are parts of Chapters 1, 2 and 7, mainly in the presentation of contemporary forms of education, models in e-learning, e-learning environments and the design and preparation of electronic and distance form of learning.

Monograph [22] refers to environment of the type "electronic university" created in the Universty of Povdiv “Paisii Hilendarski” (PU). An analysis made on the occasion of the PeU system design, concerning the creation of a university information system, is attached. In addition to brief descriptions of the created and experimented software prototypes of PeU modules – E-student, E-teacher and E-administrator, components for managing the student enrollment campaign, making inquiries, electronic payments, etc. are also presented. An accessible interface technology has also been experimented within PeU. Special attention is paid to specialized tools designed for conducting quality e-learning - modules for adaptive learning, for automated creation of test units and accessibility.

Monograph [10] is concerned with systematization of information on the following topics: systems and standards for e-learning, standards for cultural-historical heritage, standards and systems for e-learning and cultural-historical heritage (in Bulgarian context), standards for multimedia content, digital repositories, spatial information standards and applications with e-learning standards. The results in the field of standardization and automated generation of metadata for e-documents in different formats (text, graphics, audio, multimedia, etc.) obtained within the project "Automated generation of metadata for specifications and standards of e-documents" are also presented. The personal contribution of the author is in presenting the standards for cultural and historical heritage, multimedia content and e-learning.

Monograph [16] reviews the current trends in the field of digitization of cultural heritage, as well as the research carried out within the project "Automated generation of metadata for specifications and standards of e-documents". The main contribution of [16] is in the areas related to the organization of digital content, metadata generation and methods for enhancing resource discovery, which are discussed in 5 chapters: Digitization of cultural heritage – standards, institutions and initiatives; REGATA – regional aggregator of heterogeneous cultural artifacts; Automatic retrieval of metadata from art images; APICAS – content-based images retrieval in art image collections utilizing colour semantics; Automatic metadata generation and digital cultural heritage. The author's contribution is in presenting research in the field of realization of virtual tours and metadata identification for description of various digital artifacts.

The publications of the candidate focus on the following main contributions:

1. Proposed approaches for:

• gamification in a traditional e-learning environment through the use of appropriate elements and techniques of e-games; [24, 26, 30, 31, 37, 40]

• creation, accompanying and tracking of interactive learning activities in an independent mobile environment based on the xAPI standard; [32, 34, 38, 41]

• invariant teaching and learning of computer programming, regardless of the specific programming language; [19, 23, 27]

• automatic generation of different test questions from one accumulating test question; [3]

• creation of mobile games in support of the teaching of mathematics to pupils in primary school on the basis of a variety of game types and with applied game-based methodology; [36]

• standardization of e-learning in Bulgaria by creating an integrated national information environment for e-learning and automated creation of digital repositories based on standards, specifications and models for e-learning; [2]

• ensuring interoperability of a specific university information system with the relevant European standards; [4]

• portability of museum metadata to Europeana through selection and correspondence of metadata in order to create a regional aggregator; [7, 10, 16]

• description and publication of scientific content on the basis of structured data (metadata of relevant standards) to increase the visibility of scientific papers, published on the Web, through integration in social media; [39]

• development of green software for mobile devices through localization of mobile applications; [35]

• providing protection of NoSQL databases by encrypting and configuring services; [28]

2. Developed models for:

• the process of gamification of e-learning based on the game elements, techniques and actions of e-games that are suitable for gamification of e-learning; [24, 26, 30, 31, 37, 40]

• the process of tracking interactive learning activities carried out in different educational environments, based on the xAPI standard; [32, 34, 38, 41]

• e-learning (including e-course) based on information and assessment units and logical connections between them; [9, 21]

3. Proposed methodologies for:

• creation of a gamified e-course from any subject area in an e-learning environment (including according to the game type of the learners); [24, 26, 30, 31, 37, 40]

• gamification in collaborative face-to-face learning supported by a cloud environment; [43]

• collaborative and project-based e-learning based on diverse and controlled engagement of learners throughout the learning process through the use of a variety of learning resources and activities in an e-learning environment; [18, 25, 29]

• classification of syslog messages based on rules for classification of messages in a tree-hierarchy of regular expressions; [12, 17]

4. Classification of items, aiming at relevant systems implementation:

• the main template algorithms (invariants) that are taught during the training in computer programming; [19, 23, 27]

• the game types, suitable for mobile realization and in the learning of mathematics in the primary school; [36]

• the main types of accumulating test questions for automatic generation of many different test questions from them; [3]

5. Design and implementation of:

• tools (plugins) for gamification of a learning course in an e-learning environment by achieving a game view and using specific game elements; [24, 26, 30, 31, 37, 40]

• tool (plugin) for automatic creation (from e-course) of an interactive e-book in EPUB format for accompaniment and tracking of interactive learning activities, regardless of the learning environment used; [32, 34, 38, 41]

• system for training in computer programming based on invariants, including assignments from different cognitive levels of Bloom's taxonomy; [19, 23, 27]

• environment for e-learning PeU based on information and assessment units and the logical connections between them; [9, 22]

• S-Syslog system (server application, web-based application and RESTful API for communication between the them), as well as cloud-based CloudLog system for working with logs from multiple sources using the syslog protocol, based on a methodology for classifying syslog messages; [12, 17]

• system accompanying the process of administration of bachelor's or master's thesis on the basis of a system for modeling business processes; [14, 15]

• system for administration of elective learning courses during the different stages of their existence; [11]

• system, realizing the extraction of metadata from photo files in order to find information about the content and context of raster images; [6, 10]

• two virtual tours of the Ethnographic Museum in Plovdiv – panoramic and 3D, as well as a 3D model of the museum; [8, 13, 16]

6. Performed experiments and analyzes of the obtained results, proving the applicability of the proposed approaches, methods and methodologies, from:

• gamified learning in an e-learning environment with and without the use of the implemented plugins for gamification, as well as in traditional face-to-face learning supported by a cloud environment; [30, 40, 43]

• learning through interactive e-book and m-learning supported by cloud technologies; [20, 41]

• collaborative and project-based e-learning; [18, 29]

• pilot e-learning with different e-courses. [1, 5]

The textbook "Object-Oriented Design and Programming" [45], co-authored by Assoc. Prof. Elena Petrova Somova, clarifies the nature and principles of object-oriented programming (OOP);

According to the lists, submitted by the candidate, 125 citations were observed (not presented in previous procedures), of which 26 are referenced and indexed in world-famous databases with scientific information.

Assoc. Prof. Elena Petrova Somova has participated in 15 international, national, regional, and university projects, having been the leader of one national project.

She is a member of the editorial board of 1 scientific publication "ERSICT International Journal" Emerging Research and Solutions in ICT ".

The candidate participates as a reviewer in 10 scientific journals.

According to the information provided, she has lectured at 6 foreign universities, 3 of which in the last 5 years.

She is the leader of 16 international projects, 2 of which under the Erasmus + program and 14 under the Central European program for exchange in university education.

The candidate participates in 9 international projects, 2 of which in the last 5 years
and in 10 national projects, 3 of which in the last 5 years

Overall, I would like to emphasize that the publications of the candidate present significant originality, innovation and a number of results, with a marked scientific and practical contribution. I believe that all submitted scientific papers are relevant to the competition area.

The publications in renowned editions and conference proceedings advise the interested researchers on the relevance of the results obtained by Assoc. Prof. Elena Petrova Somova in the professional field "Informatics and Computer Science".

CONCLUSION

The documents and materials submitted by Assoc. Prof. Elena Petrova Somova PhD meet all the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for implementation of ZRASRB and the relevant Regulations of the University of Plovdiv "Paisii Hilendarski".

After getting acquainted with the materials and scientific works presented in the selection process, analysis of their significance and the scientific and applied science contributions contained in them, I give my positive assessment and recommend Assoc. Prof. Elena Petrova Somova PhD to be elected “Professor” at the Faculty of Mathematics and Informatics of Plovdiv University "Paisii Hilendarski" in the field of higher education 4. Natural sciences, mathematics and informatics Professional field 4.6 Informatics and computer science (Informatics).

06.03.2021 г. **Signature**: ……

Prof. Georgi P. Dimitrov