REVIEW

by Prof. DSc. Daniela Ananieva Orozova

Trakia University, Stara Zagora

on a Dissertation for awarding educational and scientific degree "Doctor" (Ph.D.), in

Area of Higher Education *4. Natural Sciences, Mathematics, and Informatics*

Professional Field *4.6. Informatics and Computer Sciences*

Doctoral program *"Informatics"*

Author: *Vladimir Hariev Tsvetkov*

Subject: *"Adaptivity in an e-learning system based on pedagogical patterns"*

Supervisor: *Assoc. Prof. Stanka Ivanova Hadzhikoleva, Ph.D., University of Plovdiv "Paisii Hilendarski".*

1. General description of the presented materials

By order № PD-21-653 of 21.03.2024 of the Rector of Plovdiv University "Paisii Hilendarski" (PU) I was appointed as a member of the Scientific Jury to provide the procedure for the defense of a dissertation titled "Adaptivity in an e-learning system based on pedagogical patterns" for awarding the educational and scientific degree "Doctor" in the Area of higher education "4. Natural Sciences, Mathematics, and Informatics", Professional field "4.6. Informatics and Computer Sciences", the doctoral program "Informatics". The author of the dissertation is Vladimir Hariev Tsvetkov – a Ph.D. student in full-time education at the department "Computer Informatics" of the Faculty of Mathematics and Informatics at the University of Plovdiv "Paisii Hilendarski", with supervisor Assoc. Prof. Stanka Hadzhikoleva.

The set of materials presented by Vladimir Tsvetkov is in accordance with Art. 36 (1) of the Rules for the Development of the Academic Staff of University of Plovdiv "Paisii Hilendarski", and it includes the following documents:

1. Application to the Rector for opening a procedure for the defense of the dissertation;
2. CV in European format;
3. Protocol from the Department Council, related to reporting on the readiness for opening the procedure and the preliminary discussion of the dissertation;
4. Summaries in Bulgarian and English;

5. Declaration of originality and authenticity of the attached documents;
6. Information on compliance with the minimum national requirements;
7. List of scientific publications on the topic of the dissertation;
8. Dissertation thesis;
9. Copies of scientific publications on the topic of the dissertation. The Ph.D. student has attached 7 publications on the topic of the dissertation.

2. Brief biographical data about the Ph.D. student

Doctoral student Vladimir Tsvetkov graduated from University of Plovdiv "Paisiy Hilendarski" in 2018 as a bachelor and in 2019 - as a master. He was enrolled as a full-time PhD student in 2020.

After 2018, Vladimir Tsvetkov worked successively for Seeburger Bulgaria, Adastra Bulgaria, Paysafe Group, Resolve Systems, A1 Bulgaria EAD. His main duties are related to business process automation and software engineering.

3. Relevance of the topic and expediency of the set goals and objectives

The dissertation study examines the possibility of integrating pedagogical patterns in an e-learning environment and applying adaptability to the created training materials. Undoubtedly, the implementation of good practices for e-learning is an interesting and relevant goal.

A methodology has been chosen and corresponding tasks have been set, which are suitable for achieving the set goal. The tasks are:

1. Study of theories, models and systems related to the application of pedagogical patterns in e-learning;
2. Conducting a study on the applicability and benefits of pedagogical patterns in training;
3. Creation of a conceptual model for the use of pedagogical patterns;
4. Design and development of a software prototype of a tool for modeling pedagogical patterns in an e-learning environment;
5. Development of practical examples of using pedagogical patterns in e-learning.

4. Knowledge of the problem

Pedagogical patterns and methods for their integration into an e-learning system have been thoroughly reviewed. Various adaptability methods applicable in an e-learning environment are

presented. The analysis of the current state of scientific research, made in the first chapter, as well as the presented program implementation, suggest that the doctoral student has a thorough knowledge of the problem, possesses the knowledge and skills to solve it.

5. Research methodology

The research methodology is standard and includes subject area research followed by modelling, software design and implementation, as well as experiments, analyzes and evaluations related to the use of pedagogical patterns in an e-learning environment.

6. Characteristics and evaluation of the dissertation

Vladimir Tsvetkov's dissertation on "Adaptability in an e-learning system based on pedagogical patterns" is 142 pages long. It consists of an introduction, four chapters and a conclusion, a list of the author's publications on the topic, noted citations, a declaration of originality, a list of the literature used. The bibliography includes 132 sources, of which 13 are in Cyrillic and 119 are in Latin. The text contains 53 figures.

Chapter 1. ***Pedagogical Patterns***, the subject area is presented. The types of patterns, pedagogical patterns, languages for pedagogical patterns, software tools and repositories for working with pedagogical patterns are considered. Opportunities for adaptability in learning related to individual learning styles and learners' perception of information are presented.

Chapter 2. ***Models for Learning Based on Pedagogical Patterns*** a basic concept for integration and use of pedagogical patterns in an e-learning system is proposed. The architecture of the application, its main modules, functionalities, types of users and their main activities are presented. The concepts of *a pedagogical pattern in an e-learning environment* and *an instance of a pedagogical pattern* are introduced, such as: implementation of a pattern for presenting specific knowledge; building block in lessons; object used and managed by users with different roles.

Chapter 3. ***Development,*** describes the development process of a software plugin for modeling pedagogical patterns in the Moodle e-learning environment. The main functionalities of the software prototype are presented with numerous screenshots.

Chapter 4. ***Practical Application of Pedagogical Patterns in E-Learning***, the results of a study on the use of pedagogical patterns in training are presented. Ideas are proposed for the implementation and use of specific pedagogical patterns in the Moodle e-learning environment with the help of the developed plugin.

In ***Conclusions***, a summary of the activities carried out to solve the tasks and achieve the goals of the dissertation is made. The obtained results and the main contributions of the dissertation are noted. Prospects for future development are formulated.

7. Contributions and significance of development for science and practice

I accept the main results and contributions identified by the Ph.D. student. The contributions have a scientific, scientifically applied, and applied character:

- A conceptual framework for a learning system based on pedagogical patterns has been created.
- A pattern model which sets a framework for the abstract description of pedagogical patterns has been developed;
- A model of a pedagogical pattern instance suitable for software implementation has been proposed.
- A plugin in Moodle for working with pedagogical patterns has been developed.
- Practical examples of using pedagogical patterns through Moodle's standard learning activities and resources have been developed.

8. Assessment of dissertation publications

The main results of the Ph.D. student's research have been reported at 3 scientific conferences, and 2 scientific and educational seminars. Results of the dissertation research are presented in 7 publications in peer-reviewed editions.

The analysis of the scientific works shows the following:

- **2 publications are in specialized journals**, one indexed in SCOPUS (SJR=0.632), and the other in Web of Science (IF=0.8);
- **5 publications are reports from national and international scientific conferences,** held in Bulgaria;
- **2 publications are** indexed in the scientific database **Scopus** or **Web of Science**;
- **2 publications are in English**.

The presented publications are distributed over time as follows:

Year	2017	2018	2021	2022
Number	2	1	1	3

The publications are equivalent to 48 points, thereby meeting the national minimum requirements of 30 points **for obtaining a PhD degree in the professional field 4.6. "Informatics and Computer Science"**.

There are **7 citations of 3 of the publications** on the topic of the dissertation (4 by foreign authors and 3 by Bulgarian authors). **Three of the citing publications are indexed in SCOPUS or Web of Science**, which is an indicator of the relevance of the topic under consideration.

A declaration of the originality of the obtained results and contributions is presented.

9. Personal participation of the Ph.D. student

I believe that the results achieved in the dissertation of Vladimir Tsvetkov are his personal work. I accept that the Ph.D. student's contribution to the presented collective publications is comparable and commensurate to that of the other authors.

10. Abstract

The abstracts in Bulgarian and English meet the volume and content of the requirements for accurate, complete, and concise coverage of the dissertation.

11. Critical remarks and questions

The total number of co-authors of the doctoral student is 5, which is an indicator of the presence of teamwork skills. Having independent publications on the topic of the dissertation would be an advantage.

The main emphasis in the software implementation is the integration of pedagogical patterns in an e-learning system. Adaptability, which is an important component of the dissertation topic, can be examined in more detail in the context of its implementation through the use of pedagogical patterns. It is likely that the lack of other similar software developments on the subject has slowed down work on adaptability.

I have the following questions for the doctoral student:

1. Is it possible to implement patterns from different pattern languages through the created plugin or does it need to be improved?

2. To what extent the implementation of adaptability relies on the built-in capabilities of Moodle and to what extent on the capabilities provided in the pattern model?

12. Personal impressions

From the published materials and submitted documents, my impressions of Vladimir Tsvetkov are entirely positive.

13. Recommendations for future use of dissertation contributions and results

The idea of the integration of different pedagogical and methodological approaches in e-learning environments is innovative and has potential for further research. I recommend the doctoral student to continue his work on the topic and the development of software tools for working with pedagogical patterns. In order to acquaint a wider scientific community with the achieved results, it is good to present them in specialized conferences and publications in English.

CONCLUSION

The dissertation contains scientific, scientifically applied and applied results, which represent an original contribution to science and meet the requirements of the Law for Development of the Academic Staff in the Republic of Bulgaria (LDASRB), The Regulations for application of LDASRB, and the relevant Regulations of the University of Plovdiv "Paisii Hilendarski".

The Ph.D. student Vladimir Hariev Tsvetkov has in-depth theoretical knowledge in his specialty "Informatics" and proven abilities for research.

Due to the above, I confidently give my ***positive assessment*** of the research presented by the dissertation reviewed above, abstract, results, and contributions, and ***I propose to the Honorable Scientific Jury to award the educational and scientific degree "Doctor"*** to **Vladimir Hariev Tsvetkov** in the Area of higher education: **4. Natural sciences, mathematics and informatics**, Professional field **4.6. Informatics and computer sciences**, Doctoral program **Informatics**.

18.04.2024 **Reviewer**: .....
(Prof. DSc. Daniela Orozova)