STATEMENT

for the award of the degree of Doctor of Education and Science in the field of higher education: 1. Pedagogical sciences,

Professional field: 1.3. Pedagogy of Education of ..., doctoral program: Methodology of Education in Physics, Faculty of Physics of the University of Sofia St. Kliment Ohridski

The review is written by **prof. Adriana Lubomirova Tafrova-Grigorova, PhD**, retired professor of University of Sofia St. Kliment Ohridski, appointed as a member of the scientific jury by order No. № РД 38-311/03.07. of the Rector of Kliment Ohridski University of Sofia (SU).

Dissertation topic: Creating and using information systems for team problem solving in physics education

Author of the dissertation: Fabien Teofanis Kunis

I. General description of the submitted materials

1. Details of documents submitted

The candidate Fabien Theofanis Kunis has submitted a dissertation and an abstract, as well as all the documents according to the requirements of the Act on the Development of Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations to it and the Rules of the Conditions and Procedure for Acquisition of Scientific Degrees and Holding of Academic Positions at Sofia University "St. Kliment Ohridski". A comparative table with recommended requirements of the Faculty of Physics is also presented, as well as all other required documents such as CV, declaration of authorship, orders for enrolment in the doctoral program and disenrolment with the right to defend, certificate of passing exams from the individual plan, protocol for checking the originality of the dissertation and the opinion of the scientific supervisor Assoc. Prof. Dr. Maya Gaidarova regarding the procedure for preventing plagiarism. The documents submitted for the defence are in order and there is no evidence of plagiarism. The doctoral student has successfully passed all six exams of his individual plan with a grade of excellent 6.00. The nature of the courses indicates that he has received a broad training in a variety of research fields such as *Methods and Techniques in Sociology*, *Psychology of Virtual World and Social Networks*, *Cultural Psychology and Intercultural Mediation*, etc., which has contributed to his development as a researcher in the interdisciplinary area of his dissertation work – physics, information technologies, education. Three of the exams were passed in English – a confirmation of the high level of proficiency in the foreign language.

2. Information about the candidate

A brief biographical reference

Fabien Kunis is a graduate of the Faculty of Physics of Sofia University – Bachelor of Engineering Physics and Master of Science in Microelectronics and Information Technology. His diploma theses are related to the application of digital technologies in physics education: *Computer simulations of non-linear processes - siltons and chaos* (for bachelor's degree) and *Cellular automata in physics simulations* (master's degree). Graduated from both degrees of higher education with honors. Additionally, he qualified as a teacher - also with full distinction. These biographical facts testify to the candidate's solid background, which is a prerequisite and basis for his work as a doctoral student. His work as a teacher of physics and astronomy, and computer science and information technology has enabled him to apply innovative methods and experimentally test the digital resources he has developed.

3. General description of the candidate's scientific achievements

Fabien Kunis's research work, as presented through his dissertation and publications, is in an interdisciplinary field that links physics as a science with its pedagogical aspects in school education, and this is mediated by digital technologies. The formation and development of students' collaborative problem solving skills in a digital learning environment is crucial for the adolescent generation because sharing ideas, knowledge and efforts with others to collaboratively solve non-routine problems is necessary both in professional environment and in everyday life. That is why these skills are identified as key 21st century skills.

Collaborative problem solving is no accidentally in the focus of the Organization for Economic Cooperation and Development (OECD), whose international research program, known as PISA, introduced in 2015 an additional innovative module called Collaborative Problem Solving Solving. Bulgarian 15-year-old students ranked last among the European Union countries for this module – 444 points, which is 56 points lower than the average score of the OECD countries. These low scores, as well as Bulgaria's low scores in science, have motivated Mr. Kunis to develop a conception, tools and models to form students' skills by pooling their knowledge and efforts to deal with problems where the way to find the solution is not apparent. The realization of this goal is planned carefully in the dissertation and is adequately reflected in the relevant publications. There are six of them, and a seventh publication has been submitted, but it has not yet gone through peer review, so I will not comment on it. Among the six publications, two were published in a journal referenced in SCOPUS and Web of Science (Q4). One of these two publications has three authors, with Mr. Kunis as the first author, and the other has four authors, with Mr. Kunis as the third author. Therefore, the candidate has fulfilled the requirements of the Faculty of Physics – he has two publications in group II (Q3/Q4) and in one of them he is an author with a significant contribution. Two other co-authored articles have been published in *Science, Engineering & Education* – a journal listed in the National Reference List of contemporary Bulgarian scientific publications with scientific review of the National Centre for

Information and Documentation. The authors of these articles are respectively two and three. The other two publications are also two- and three-authored, with Fabien Kunis as first author in both. These articles are published in the Open Schools Journal for Open Science, a European peer-reviewed, free-to-publish European scientific journal. The candidate's total score according to the Regulations of the ADASRB (Area 1. Pedagogical sciences, Tables 1 and 2) is 84 points: 34 points for the publications in Group D and 50 points for the submitted dissertation (Group A) with a minimum requirement of 80 points for the award of the degree of Doctor. So, the minimum national requirements (under Article 2b, paragraphs 2 and 3 of the Law on Ph.D.) and the additional requirements of St. Kliment Ohridski university have been fulfilled. The doctoral candidate has shown outstanding activity by his participation in 18 national and international scientific conferences – independently or in co-authorship. These appearances increase the public visibility of the dissertation results and at the same time indicate the candidate's ability to present his scientific production to the professional and scientific community, which is one of the goals of the PhD degree as a scientific and educational degree.

4. Analysis of the candidate's scientific and applied achievements presented in the dissertation.

The dissertation consists of 172 pages and 20 pages of appendices. Nearly 200 references are cited, most of them in English. As noted above, the core competency of collaborative problem solving in a learning environment has an important role to play in preparing young people for their future professional careers. To study the concept, tools and models created for the formation of this competence in students, Mr. Kunis has presented a list of 8 successive tasks, which is in fact a research plan. In the dissertation outline, he sequentially describes the preparation and implementation of the set tasks so that the reader can easily follow the stages of the research. The main method of his pedagogical research is a didactic experiment with a control and experimental group. The sample was stratified and consisted of from seventh to tenth grade students. It is noteworthy that the doctoral student has previously and in detail familiarized himself with various methods of pedagogical research in order to choose the most suitable one for the purposes of his research.

In my opinion, the most valuable outcome of the thesis work is the creation of the information system for team problem solving. The system designed by Fabien Kunis has a number of merits, some of which are the following: in addition to Physics and Astronomy, the system can be extended and used for any of the other subjects; it can be operated in test mode, and competences in science, mathematics, humanities and social sciences, etc. can be tested with it; the system can be adapted and customised as the student performs the tasks; the system can be operated both online and offline.

In addition to the qualities of the information system created by the doctoral student, I also highly appreciate his skills to select and apply appropriate statistical methods for evaluating the results of the didactic experiment, as well as to analyzing them in an adequate way, so that the conclusions reached are justified.

The dissertation research of Fabien Kunis has a scientific and applied character. It may prompt teachers to use more effective methods and strategies to develop their students' teamwork and to solve problems of both a private-scientific and interdisciplinary nature. I accept the theoretical and applied contributions presented by the candidate and share his ideas for future research development, especially the influence of the age factor in collaborative problem solving.

I will also note that the abstract correctly reflects the structure and main results achieved in the thesis, while meeting the requirements for this type of publication.

5. Critical notes and recommendations

The only critical remark I could make to the candidate concerns the section "Main results of the study" in the final part. My comment is not on the content of the section, but on its title. I think it would be more appropriate to have it as „Completion of planned tasks“ or something similar, since it is in fact the planned tasks completed by the doctoral candidate that are being listed, not the results of the research.

6. Personal impressions of the candidate

I do not know the candidate personally, only indirectly through the documents he provided and his dissertation work.

7. Conclusion

Having read the submitted dissertation, the abstract and other materials, and based on the analysis of their significance and scientific and applied contributions, **I confirm that the scientific achievements meet the requirements** of the Act on the Development of Academic Staff in the Republic of Bulgaria, its Regulations as well as the Rules of Sofia University St. Kliment Ohridski for the acquisition of the educational and scientific degree "Doctor". The results of the work have been made known to the scientific community by publishing them in scientific periodicals and reporting them at scientific forums.

The candidate fulfils the minimum national requirements in the professional field 1.3. *Pedagogy of Education in…* and no plagiarism has been found in the dissertation, its abstract and scientific works submitted for the competition.

I am pleased to give my **positive** evaluation of the dissertation.

II. GENERAL CONCLUSION

Based on the above, **I confidently recommend to the Scientific Jury to award the degree of Doctor of Education and Science in the professional field 1.3. *Pedagogy of Education in*... to Fabien Theofanis Kunis.**

15/09/2023 Member of the Scientific Jury: .....

(signature)

prof. Adriana Tafrova-Grigorova, PhD