



OPINION

on dissertation work for obtaining
the educational and scientific degree "Doctor"

Author of the dissertation: **MSc Borislava Lyubomirova Kostova**

Title of the dissertation: **Integrating 3D printing, robotics and emerging technologies for the purposes of education**

Doctoral program: **Application of the principles and methods of cybernetics in various fields of science**

Professional field **5.2. Electrical engineering, electronics and automation**

Member of scientific jury: **Prof. DSc Eng. Ivan Stoyanov Yatchev**

1. Relevance of the problem developed in the dissertation

The topic of the dissertation is actual. The implementation of modern technologies in education, including 3D printing, robotics and artificial intelligence technologies, is a prerequisite for maintaining and improving the level of the educational process.

2. Degree of knowledge of the state of the art of the problem

The author has demonstrated a very good knowledge of the problem. A bibliographic reference of 140 sources, including 5 websites, is presented, all of them in English. A detailed literature review with in-depth analysis is also made.

The aim of the dissertation is to develop, validate and analyze an approach for integrating 3D modeling, 3D printing, robotics and artificial intelligence technologies in order to increase the effectiveness of educational STEAM activities. To achieve this aim, 5 tasks have been posed and solved.

3. Scientific-applied contributions of the dissertation work

Main scientific-applied contributions:

- A protocol for conducting an educational STEAM activity has been proposed and validated in the educational process, which includes the use of AI to assist the teacher, 3D printed educational models and scenarios for the NAO robot;
- An approach for automated creation of 3D printed personalized models for educational purposes has been proposed and validated in the educational process, including automated generation of 3D models in the AutoCAD environment and subsequent fabrication using a 3D printer;

- The effectiveness of 3D printed writing assistive devices for students with SEN has been studied, as different approaches to creating personalized assistive devices have been analyzed and methods for adaptation and taking individual sizes have been studied.

There are also applied contributions related to developed software supporting the implementation of the proposed protocol and approach.

4. Evaluation of publications on the dissertation work

5 publications have been made on the dissertation work (according to the information in the abstract of the dissertation), of which 3 are in editions, referenced and indexed in world-renowned databases of scientific information - Scopus and Web of Science, one of them in an edition with SJR. Four publications are in proceedings of international conferences abroad and one has been reported at an international conference in Bulgaria. One publication is individual, and the rest are collective - one with 3, one with 4, one with 5 and one with 6 authors, with the author being in first place in 3 of them. All publications are in English.

The minimum national requirements, those of PURPNSZAD of the BAS and the internal rules for the development of the academic staff of the IR have been fulfilled, with group of indicators Γ significantly exceeding the required minimum.

The presence of citations of publications on the dissertation also makes a good impression.

5. Critical remarks and recommendations

There is some incompleteness in citing several literary sources. It would also be good if the list of literature was in alphabetical order.

CONCLUSION

Taking into account the results and contributions obtained in the dissertation, as well as the quantity and quality of the publications to it, I give a **positive** assessment of the dissertation and strongly suggest that **Borislava Lyubomirova Kostova** be awarded the educational and scientific degree "Doctor" in the field of higher education 5. Technical sciences, professional field 5.2. Electrical engineering, electronics and automation, doctoral program "Application of the principles and methods of cybernetics in various fields of science".

Date: 9 Sept 2026

MEMBER OF THE JURY:

/Prof. DSc I. Yatchev/