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СОСТОЯНИЕ И ТЕНДЕНЦИИ РАЗВИТИЯ STEM-ОБРАЗОВАНИЯ В БОЛГАРИИ

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Аннотация. В статье подчёркивается приверженность Болгарии образованию STEM. Описываются некоторые образовательные реформы и создание Национального центра STEM, целью которого является улучшение образования STEM в болгарских школах. В статье отмечаются усилия Болгарии по развитию технологически грамотной рабочей силы при поддержке правительства, образовательного сектора и бизнес сотрудничества, чтобы обеспечить экономическое развитие страны и глобальную конкурентоспособность в технологическом секторе.

Ключевые слова: болгарская система образования, STEM-образование, STEM-центры

In recent years, there has been a global emphasis on promoting Science, Technology, Engineering, and Mathematics (STEM) education, and Bulgaria is no exception. The country traditions in the field of STEM have deep roots, reflecting a rich history of scientific achievements and contributions.

In this regard, Olympiads in mathematics, informatics, physics, and other fields are a longstanding extracurricular activity. The successes of such Olympiads, where Bulgarian students of different ages achieve significant results, are indicative. For example, as of November 10, 2023, the medals won by Bulgarian students at various international Olympiads are over 70 (https://dnes.dir.bg/obshtestvo/ravnosmetkata-za-2023-nad-70-zlatni-medala-specheliha-balgarski-uchenitsi-ot-olimpiadi-po-sveta). Bulgaria is a founding member of many international competitions.

For the last couple of decades, Bulgaria underwent significant educational reforms. The restructuring aimed to modernize the education system, adapt to democratic principles, and align with European standards. Over the years, there have been efforts to introduce innovative teaching methods and technologies in Bulgarian schools. This includes the integration of Information and Communication Technologies (ICT) in the classrooms to enhance the learning experience.

Bulgaria places a strong emphasis on STEM education from early school age. Curricula are designed to foster interest and competence in these areas, aiming to prepare students with the necessary skills to be competitive in the labor market. Efforts have been made to integrate hands-on STEM learning into the education system.

A survey of the opinion of teachers from the initial stage of the basic educational level about the applicability of STEM education shows that they emphasize “the interrelationship between STEM education and project-based learning activity, since in both cases teamwork and cooperation between teachers and students on topics are dominant , allowing the use of such type of training” (Стаменова, 2022, 69).

High school research is another established STEM activity, facilitated by research organizations providing mentorship and resources to talented students. The High School Students Institute of Mathematics and Informatics, operating since 2000, organizes conferences and an

international summer school, promoting research in mathematics, computer science, ICT, and astronomy. It also offers grants to students in the field of STEM.

In April 2018, the Republic of Bulgaria joined EU STEM Coalition. The EU STEM Coalition is a network aimed at improving STEM education across Europe to foster economic growth and well-being. It collaborates with policymakers, educators, and industry to address skills mismatches in STEM fields. The coalition serves as a central hub for sharing best practices, data, and solutions. It facilitates cooperation among national STEM platforms, which are organizations responsible for implementing STEM strategies. The coalition organizes various activities such as conferences, working groups, and webinars to promote knowledge exchange and develop new approaches. Additionally, it provides direct support through policy briefings, taskforces, and roundtables to assist stakeholders in implementing effective STEM education strategies (https://www.stemcoalition.eu).

The country supports students through mentorship from active researchers, and schools encourage participation through extracurricular courses funded by programs like the Operative Programme „Science and Education for Smart Growth“.

The Bulgarian education system has a strong tradition of supporting STEM education, with various non-governmental and academic organizations playing a key role in STEM initiatives.

It can be seen that both the Ministry of Education and Culture and NGOs encourage, support and finance the preparation of talented Bulgarian children for their participation in various national and international forums. In this context is extremely important the established in 2020, the beginning of the creation of school STEM centers was set. They are an integrated set of purpose-built and equipped learning spaces with a focus on the learning and application of competences in mathematics, science and technology (Стаменова, 2022, 9). And not only that - attention is directed to all students as the number of schools and universities in which STEM centers are established is gradually and continuously increasing. The idea is to stimulate students to a more in-depth study of mathematical, natural and technical sciences.

The current priorities of the Bulgarian Ministry of Education and Science in STEM education include intensifying STEM skills among students, parents, and educational authorities. Funding is allocated for innovative STEM projects, interdisciplinary collaborations, and the development of change management strategies. Emphasis is placed on enhancing STEM infrastructure, digitizing STEM labs, facilities, and libraries, and promoting equality and integration through learning communities.

The country has a tradition of establishing specialized high schools that emphasize mathematical and natural sciences. These schools often offer a curriculum with a strong focus on subjects like mathematics, physics, chemistry, biology, and computer science. Bulgaria has specialized high schools that focus on providing advanced education in specific areas. These schools aim to support talented students and prepare them for further studies and careers in science and technology. Efforts have been made to integrate STEM education into the broader curriculum and create opportunities for students to engage in hands-on scientific projects.

The Bulgarian government has shown support for initiatives that aim to enhance science education at various levels. This includes providing resources, infrastructure, and scholarships to encourage students to pursue scientific studies.

The national curriculum in Bulgaria includes a strong emphasis on science education. Subjects such as physics, chemistry, biology, and geography are part of the standard curriculum in both primary and secondary education. The national curriculum in Bulgaria includes a strong emphasis on science education. Subjects such as physics, chemistry, biology, and geography are part of the standard curriculum in both primary and secondary education. Students typically have the option to specialize in different tracks, including natural sciences. Those of them who choose the natural sciences track receive more in-depth education in this area.

Bulgaria has been working on initiatives to enhance STEM education, including promoting extracurricular activities, competitions, and projects that involve science and technology. Various extracurricular activities and competitions are organized to stimulate interest in innovation and

creativity among students. These may include science fairs, robotics competitions, and other events that encourage hands-on learning and problem-solving skills.

In connection with the establishment of the National STEM Center in January 2022, Regulations (Правилник, 2022) for its organization and activities are issued. The center functions as an independent legal entity with budget support, and its activities support three regional STEM centers. The main functions of the National STEM Center include coordinating and supporting the development of an integrated educational environment in science, technology, engineering, and mathematics (STEM) across Bulgarian schools. This involves creating learning models, working with scientific research methods and tools, and focusing on professional development and qualification. The center aims to implement measures outlined in the Strategic Framework for Education, Training, and Learning Development in Bulgaria (2021 – 2030) (Стратегическа рамка) and the National Recovery and Sustainability Plan (Национален план).

To achieve its goals, the center supports the Minister of Education and Science in organizing, controlling, administering, and managing a project to create a National STEM environment for the skills of tomorrow. It coordinates the monitoring and sharing of practices, develops a research environment, supports the construction and development of STEM environments in schools, develops practical guides for teachers, organizes courses and seminars, prepares national Olympic teams in various STEM fields, supports student research communities, and organizes regional, national, and international forums. Funding for the center comes from the state budget, European, international, and national projects and programs, revenues from activities and services, and donations. The center is managed by a director appointed by the Minister of Education and Science, supported by deputy directors and regional STEM center heads. The internal structure includes a financial controller, an internal audit unit, a public relations expert, four departments, and the regional STEM centers. The work in the center is organized through internal rules, procedures and guidelines established by the director, ensuring the smooth operation and achievement of its goals.

In the Strategic Framework for the Development of Education, Training and Learning in the Republic of Bulgaria (2021 – 2030) (Стратегическа рамка), 9 priority areas are identified. Among them are educational innovation, digital transformation and sustainable development. An increased enrollment of students in schools offering training in STEM fields and for the acquisition of professional education is indicated as a strength, which undeniably shows the state's desire to develop and maintain a good level in the field of STEM disciplines.

The framework emphasizes the need to improve the educational environment by identifying a STEM environment that requires the application of new teaching methods stimulating the acquisition of lasting knowledge oriented to high-tech industries. Emphasis is placed on the need to create student research communities in the school STEM environment together with representatives of the scientific community and business.

In 2023, Bulgaria's strategic initiatives and investments in STEM education, along with collaboration between the government, the education sector and the business community, pave the way for significant progress in the field. These efforts are aimed not only at meeting the immediate need for qualified specialists, but also at ensuring the long-term sustainability and competitiveness of the Bulgarian technology industry and workforce. The development of STEM education in Bulgaria is undergoing a significant transformation, as evidenced by various initiatives and partnerships aimed at digitizing and modernizing the educational framework to meet modern technological standards. These efforts are highlighted by the active participation of Bulgarian representatives in global educational platforms, cooperation with technological giants and investments in educational infrastructure and innovation.

In this regard, in January 2024, at the Bett Global Series exhibition (Bett is a global community for education technology) in London, the Minister of Education and Science of Bulgaria discussed digitalization partnerships with managers from Microsoft and Intel. The meeting is part of a larger effort to introduce innovative educational experiences and use technology to actively engage students in a variety of learning environments, whether virtual, in-person or hybrid. Intel's

contribution of 200 STEM education lessons to be used both to create a national STEM center and to support educational institutions highlights a tangible step towards increasing the technological literacy of Bulgarian students.

The dialogue with technology companies does not stop there. A pilot project launched on January 26, 2024 between the Bulgarian Ministry of Education and Google aims to integrate the latest educational tools, including those based on artificial intelligence, in over 200 Bulgarian schools. This initiative demonstrates a commitment to adopting cutting-edge technology to facilitate and support teachers' daily work, potentially saving them significant time and improving the educational experience for students.

The Bulgarian government recognizes the importance of STEM for the country's economic development and global competitiveness. Policies and investments in STEM education and technological innovation are central to national economic growth strategies. The country boasts a highly skilled workforce in software development, information technology and engineering, driven by its strong educational foundation in STEM fields. Bulgaria has seen rapid growth in its technology sector, becoming one of the leading IT outsourcing destinations in Eastern Europe.

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https://www.stemcoalition.eu

CURRENT STATUS AND TENDENCIES IN THE DEVELOPMENT OF STEM EDUCATION IN BULGARIA

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Abstract. The article highlights Bulgaria's commitment to STEM education. It outlines some educational reforms and the establishment of the National STEM Center that aims to enhance STEM education across Bulgarian schools. The article emphasizes Bulgaria's efforts to foster a technologically literate workforce, supported by the government, educational sector, and business collaboration, to ensure the country's economic development and global competitiveness in the technology sector.

Keywords: Bulgarian educational system, STEM education, STEM centers

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