Artificial Intelligence to support STEM learning in the classroom

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Abstract: The implementation of artificial intelligence (AI) and the STEM approach in the classroom offers innovative solutions that turn learning into an interactive and transformative process. The authors of the article successfully implement projects that combine natural sciences and technologies in "Knyaz Alexander I" Elementary School, town Plovdiv. The article presents examples of good practices and the results of their implementation. In it, the authors examine applications to help the teacher (Diffit for Teachers, Magic School) and the student (Canva, Suno, D-iD, Slidesgo, Educaplay, Quizizz) related to the use of artificial intelligence. In an age of rapid technological innovation, education must meet the needs of the new digital generation of students. STEM education with the use of artificial intelligence enables students to be well prepared for the future, encouraging both creative thinking and social engagement.

Keywords: STEM, artificial intelligence, teacher, student, learning.

1. Introduction

The use of educational software in the learning process is a modern and preferred means that increases student motivation and makes learning seamless and attractive. It is essential for the modern teacher to know the main characteristics of educational platforms and digital environments, the possibilities of their integration in the learning process, as well as in extracurricular activities, taking into account the age characteristics and the level of knowledge of the students. The use of artificial intelligence allows identification of the learning process, helps its differentiation and individualization.

Currently, AI is in its early stages of development as a mainstream technology, which means that each school can find its own approach and tools that suit the school's strategy and vision, integrate them extremely quickly into the learning process and increase the quality of the educational process (Mihailov & Mihailova 2023).

https://doi.org/10.58503/icvl-v20y202508

2. Exhibition

Students today demand dynamic educational approaches that match their learning styles and interests. Applications based on artificial intelligence are a key tool for motivating and engaging students. Implementing AI in the learning process enables personalized learning, quick access to resources and the ability to create interactive content.

At the heart of the change today are prompt generators, which enable a teacher to look beyond their most commonly used pedagogical model and give them some ready-made AI-powered solution where they can use an expert model of another type of teaching, such as we are convinced that if this thing is made so that teachers can easily and intuitively work with it in a web environment (Georgieva, 2024).

The authors of the article are professors of information technology. This gives them the opportunity to introduce students to innovative educational software (Velcheva, 2021), specialized electronic systems (Stoitsov & Aneva, 2014), simulation software (Stoitsov, 2017) and how to work with them (Steriu & Stănescu, 2023).

With this article, the authors want to prove that artificial intelligence applications for creating and conducting STEM training can be used in compulsory, optional classes and in extracurricular activities related to natural sciences and information technologies in junior high school.

The authors, as school and university educators, spent months exchanging ideas and sharing innovations related to the application of artificial intelligence in the classroom in a professional learning community of educators in various fields and experts. They managed to prepare and implement several successful STEM trainings in junior high school using artificial intelligence applications in March, April and June 2024 ("Water - the source of life", "Ideathon for children", "Healthy nutrition"). The increase in the number of students who get involved in each subsequent event with enthusiasm, the involvement of the school community and institutions, the magnitude of the training that goes into the events and causes are the factors that determine success. The authors of the article, on the basis of these results, are planning and forming a class in the 5th grade with an enhanced study of natural sciences and information technologies, and the use of artificial intelligence should be included in the curriculum. The academic year 2024/2025 in "Knyaz Alexander I" Elementary School started with a STEM class of 29 students. The author of the article conducts the mandatory classes in information technology and additional ones, as well as those in natural sciences. In order to increase the hours in which the children will be educated using artificial intelligence and the STEM approach, she also formed a club "Digital Virtuality" (extracurricular activity). Mentor of the students is the author of the article, in his capacity as a teacher at the

Faculty of Mathematics and Informatics.

The author of the article shares that she uses artificial intelligence applications to:

- lesson planning (Diffit for Teachers, Magic School);
- creating tests and games (Quizizz, Educaplay);
- creating presentations (Canva, Slidesgo, Complete);
- image generation (Canva);
- creating videos (D -iD);
- music generation (Suno).

2.1 Artificial Intelligence applications to help the teacher

Diffit for Teachers is a platform that uses artificial intelligence to adapt learning resources to the individual needs of students. The application is used to create educational materials that are tailored to the different levels of student preparation. The authors of the article share that they use the platform to generate lesson plans, texts, quizzes that can be adapted to be both challenging and understandable for each student.

Magic School is a particularly useful tool for primary school STEM initiatives. Teachers can organize project-based activities, with the platform offering ideas, resources and guides.

Magic School provides digital simulations and research tools that contribute to hands-on learning. The advantages of the application are related to saving time, increasing student engagement. The platform promotes the use of new technologies and pedagogical approaches in education.

With the help of these applications, educators can create more engaging, personalized and effective learning environments that meet the needs of today's students, the authors of the article share.

2.2 Artificial Intelligence applications to help the student

In the compulsory and optional classes on computer modeling and information technology, as well as in the classes for activities of interest, the author of the article says that she introduces students from the junior high school stage to interactive applications working with artificial intelligence.

Apps for creating tests and games (Quizizz, Educaplay)

Educational technology has long focused on engaging students through games and interactivity. Apps like Educaplay and Quizizz provide platforms that

not only facilitate learning but also make the learning process fun and engaging for the digital generation. At Prince Alexander I Primary School, these applications have been successfully integrated into STEM learning, contributing to improved engagement and understanding of learning content.

Educaplay is a platform for creating educational interactive resources such as quizzes, crosswords, puzzles, video tutorials and more. As part of the training, students from grades 5 to 7 actively participate in the development and solving of tasks created through this platform. Students have the opportunity to create their own quizzes and games, encouraging them to explore the topic in depth and demonstrate critical thinking.

The results of using the application are related to the promotion of active learning through gamification.

Quizizz is an innovative platform for creating interactive tests and quizzes that take place in real time or one-on-one at a time convenient for students. The main advantages of the platform for junior high school students include:

- Motivation through competitive element;
- Custom tests with II;
- Analysis of results.

Teachers can use Quizizz's functionality to analyze answers in real time, which allows identifying gaps in knowledge and adapting the learning process, the authors of the article share.

Educaplay and Quizizz are powerful tools that integrate game elements and artificial intelligence technologies to meet the needs of the new generation of learners. These apps change the dynamics of the classroom, combining fun and learning, and are a testament to the successful transformation of traditional pedagogical approaches. Their use in STEM education creates a foundation for active and engaged learning, preparing students for the challenges of the future.

Apps for creating presentations (Canva, Slidesgo, Gama)

Canva is a powerful visual design tool that offers integration of AI technologies making it easy to create professional looking graphics. Students use Canva to design posters, badges, brochures and t-shirts. Thanks to built-in AI features such as automatic design generation, color coordination and font suggestions, they achieve high results with minimal effort. Environmental projects stimulate students to express their ideas in a creative way, while developing their visual culture and critical thinking.

Slidesgo is a platform that provides professionally designed presentation templates compatible with Google Slides and Microsoft PowerPoint. The application is extremely useful for teachers who want to present the learning material in an attractive and visually organized way suitable for the digital

generation of students.

In environmental initiatives such as Ideathon for Kids (featured further down in the article), teachers and students use the platform to create visuals that support campaigns or present solutions to environmental issues.

Slidesgo is a useful tool for bringing together data, visualizations and ideas created through other applications such as Canva, Diffit and Suno. For example, students can include diagrams generated with AI tools or images created with Canva into presentations based on a Slidesgo template, the paper's authors say.

Complete is an innovative tool that helps students create interactive presentations, data visualizations, and simulations. The platform was built with modern education in mind, emphasizing STEM (Science, Technology, Engineering and Math) and encouraging students to immerse themselves in inquiry and creative problem solving.

Music and video creation apps (Suno, D-ID)

Suno is a text authoring application that uses artificial intelligence to generate content such as poetry, essays, and descriptions. During the lessons, the 7th grade students write poems on an environmental theme, with Suno offering ideas, structures and lexical suggestions. This facilitates the writing process and makes literary creation accessible to all students, regardless of their experience.

D-iD is an innovative application that uses artificial intelligence to create text-based video content with talking avatars. This offers unique opportunities for students, enriching the learning process and encouraging the development of communication skills, creativity and technological literacy.

Students can create their own video projects by turning text material into talking avatars. This motivates them to express ideas in an interactive and visually appealing way.

Creating videos is suitable for presenting projects, telling stories or sharing research, the authors say.

D-ID and Suno provide good opportunities for students to express themselves in an innovative way, develop their digital and communication skills and learn with interest. The integration of apps in the classroom makes learning more accessible, interactive and relevant to the needs of today's generation.

2.3 Shared practice

One of the key initiatives is the "**Ideathon for Kids**", conducted within the framework of the COMPAIR project by the authors of the article. The project includes a series of activities aimed at measuring air quality and promoting a sustainable lifestyle. Participants (5th, 6th and 7th grade students) prepare projects in five categories (Figura 1):

- Video contest short videos on the topic "Protection of the environment". To create them, the students used Canva, D-iD applications and managed to achieve interaction;
- Presentations presentations on air cleanliness. The presentations were created by sixth and seventh graders using Slidesgo and Canva;
- Eco-exhibition 3D models and drawings related to Earth Day. Ideas were generated by Canva, Magic School, Diffit for Teacher;
- Literary work essays and poems on the topic "The Earth My Home";
- Advertising campaign creating games, quizzes, tests, posters and news about nature conservation (Canva, Quizizz, Educaplay).



Figure 1. Poster

The STEM training on the theme "Ideathon for Kids" lasted for a month and included preparing students and creating resources in compulsory classes, in elective classes and in interest clubs related to science and information technology.

The event took place over 3 consecutive days, including the presentation of the projects in 3 halls, filming with a drone and camera, participation of 10 classes of students, representatives of institutions, parents and teachers. It ends with an official ceremony where students present their projects to parents, teachers and representatives of the Energy Agency – Plovdiv (Figure 2).



Figure 2. Poster

The Ideathon succeeded in uniting the efforts of students, parents and the school administration, turning the school into a model for transdisciplinary learning.

This event was the largest of the 3 organized events during the academic year 2023/2024, the authors share. It is this that leads to the idea of STEM - a class in 5th grade.

From October 2024 until January 2025 the authors conduct 3 more such trainings in the specialized class - "Experimenters", "Young programmers", "Graphic editors".

Students plan the initiatives together, thereby acquiring skills for effective time management, constructive teamwork, and determining their own opportunities. Placed in a problematic situation, they learn to defend their positions, acquire a willingness to compromise, build communication skills in different environments. During all events, celebrations, competitions, causes, the students of the club conduct negotiations, set goals and manage to achieve them. They get inspired and personally commit to the causes.

The authors of the article believe that the use of artificial intelligence in the classroom offers an opportunity to expand the student's interests, develop abilities, discover new interests, develop and improve aptitudes and talents. This is the basis for acquiring personal and social competence (Borisova, Hadzikoleva, Hadzhikolev & Gorgorova, 2023).

The knowledge, facts and skills that students acquire when using artificial intelligence applications are the foundation needed to create their own digital content through critical thinking and analysis. By using interactive applications related to artificial intelligence and the STEM approach, students acquire teamwork skills, develop their critical thinking, apply their knowledge in real life, in short, go beyond the boundaries of the classroom and prepare for real life. discover their strengths and guide themselves in choosing a profession.

2.4 Learning outcomes

At the end of the 1st term, the STEM class has the highest average success in information technology (mandatory study hours) of all 7 classes in the 5th grade (Figure 3).

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Figure 3. Success

Completed 3 STEM trainings ("Experimenters", "Young programmers", "Graphic editors") with an excellent result in additional classes in natural sciences and information technology (Figure 4).



Figure 4. Shared practice

In the "Digital Reality" club, all the planned events were carried out, and not only students, but also parents and teachers participated enthusiastically in them.

3. Conclusion

The use of artificial intelligence in STEM education is changing traditional educational methods, providing students with opportunities for creativity and innovation. In "Knyaz Alexander I" Primary School, these technologies improve the quality of education. With the introduction and use of artificial intelligence in the educational process, according to the authors of the article, the teacher becomes an innovator who makes the connection between formal and informal learning, connects theory with practice, activates creativity in his students, who have the skills and competencies to work with current technologies. This leads to a modern education that meets the needs of today's digital generation and defines the place of artificial intelligence and STEM education in the educational process.

Acknowledgments

The authors express their gratitude to the National Program "Young scientists and doctoral students - 2" (stage 2) for the funding of the present work.

REFERENCES

• journal article

Borisova, M., Hadzikoleva, St., Hadzhikolev, E., Gorgorova, M. (2023), "Training of higher order thinking skills using ChatGPT", International Conference on Virtual Learning, ISSN 2971-9291, ISSN-L 1844-8933, vol. 18, pp. 15-26, 2023. doi: 10.58503/icvl-v18y202301.

Steriu, I., Stănescu, A. (2023) Digitalization in education: navigating the future of learning. *International Conference on Virtual Learning*. 18, pp. 171-182. doi: 10.58503/icvl-v18y202314.

Stoitsov, G., Aneva, S. (2014) Use of simulation software in laboratory exercises in the discipline "Computer networks and communications". *Education and Technology*. 5, 208-211.

Stoitsov, G. (2017) Assessment of the Results from Conducted Experimental Training in Computer Networks and Communications in the Laboratory Exercises. *TEM Journal.* 6(2), 185 – 191.

Velcheva, I. (2021) Basic characteristics of digital tools and their application in education. *Pedagogical Forum*. 2, 52-60.

• webpage

Canva - https://www.canva.com/ [Accessed: 02.02.2025].

D-iD - https://studio.d-id.com/ [Accessed: 02.02.2025].

Diffit for Teachers - https://app.diffit.me/ [Accessed: 02.02.2025].

Educaplay - https://www.educaplay.com/ [Accessed: 02.02.2025].

Gamma - https://gamma.app/ [Accessed: 02.02.2025].

Georgieva, M. article on "Is there an application of ChatGPT in the life of the Bulgarian teacher?", https://prepodavame.bg [Accessed: 02.02.2025].

Mihailov, B., Mihailova, B. (2023), "Guide to artificial intelligence in education", https://cpocreativity.com/ [Accessed: 02.02.2025].

Magic School - https://www.magicschool.ai/ [Accessed: 02.02.2025].

Slidesgo - https://slidesgo.com/ [Accessed: 02.02.2025].

Suno - https://suno.com/ [Accessed: 02.02.2025].

Quizizz - https://quizizz.com/ [Accessed: 02.02.2025].