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Studying the Perspectives and Career Guidance of 8th-grade Students on Science, Physics, and Future Professions through the Integration of Robotics into Physics Education

Abstract: This study aims to evaluate the perspectives and career guidance of 8th-grade students towards science by integrating robotics into physics education. The research focuses on analyzing students' interest in physics, their mastery of scientific research methods, and their attitudes toward future professions after participating in robotics activities. The study was conducted using a modified version of the TOSRA (Test of Science-Related Attitudes) questionnaire. This questionnaire has proven reliability and validity in studies conducted among secondary school students in Pakistan and was adapted to the context of 8th-grade students in Kazakhstan to explore the effects of integrating robotics into physics education. The findings reveal that incorporating robotics into physics lessons significantly enhances students' interest in the subject and fosters the development of critical thinking and scientific research skills. Additionally, students involved in robotics activities demonstrated a notably higher motivation for choosing future careers, particularly in the fields of engineering, technology, and natural sciences. This study underscores the positive impact of using robotics in physics lessons on students' career orientation and their increased interest in pursuing future careers in scientific and technological domains.

Keywords: robotics, physics education, STEM, student engagement, career orientation, research skills development.

Introduction

Students often face challenges when performing tasks solely focused on academic learning. However, they show remarkable enthusiasm when addressing real-life problems, such as conducting engineering or scientific research (Rogers, 2009). The use of robotics provides students with opportunities to develop creativity in problem-solving, build confidence, foster teamwork skills, and enhance their understanding of fundamental scientific concepts. Integrating robotics into physics education allows students to comprehend science not only theoretically but also practically. Robotics bridges science and engineering, enabling students to deepen their knowledge through innovative research (Rogers, 2009).

In the modern era, science, technology, engineering, and mathematics (STEM) play a crucial role in global education systems. However, the demand for STEM professionals remains unmet in many countries. In OECD member and partner countries, only 27% of undergraduate students enrol in STEM programs, leading to a shortage of qualified scientific personnel (OECD, 2022). Addressing global challenges, such as climate change and sustainable development, will require technical and scientific expertise, further emphasizing the importance of STEM education (Ministry of Education and Science of the Republic of Kazakhstan, 2022).

In Kazakhstan, STEM education has been rapidly developing over the past decade. For instance, since 2016, elective robotics courses have been introduced in 2,500 schools nationwide (Japashov et al., 2022). However, research and methodologies on STEM integration remain insufficient, particularly in the context of combining physics and robotics (Goldin & Shteingold, 2001). Consequently, incorporating robotics into physics lessons is an effective way to enhance students' interest in science. Robotics provides students with opportunities to solve real-world engineering and scientific problems, encouraging creative thinking, confidence-building, and teamwork skills development.

Studies highlight the relationship between teaching methods employed by educators and students' attitudes toward learning (Christidou, 2011). These findings demonstrate that aligning teaching strategies with students' interests can increase their engagement in science and enhance the overall effectiveness of the educational process. By integrating physics with robotics, students can grasp the practical relevance of science and apply their knowledge in new contexts. Teaching robotics systems captivates students' attention and establishes a connection between physics lessons and real-world issues.

This approach promotes active participation in the learning process, incorporates visual aids, facilitates review and discussion, and encourages deeper exploration of materials. These strategies make the educational process more meaningful for students and contribute to a better understanding of physics concepts (Dauletiyar et al., 2023).

Literature review

The integration of robotics into physics education offers a powerful approach to both engaging 8th-grade students and providing them with career guidance in STEM fields. Several recent studies highlight the potential benefits of this integration by focusing on aspects such as digital literacy, AI, collaborative teaching, and interactive learning.

The relationship between science and physics. Research shows that students ' interest in science is mainly depending on the teaching methods used by educators. Christidou (2011) explores relationships among the teaching strategies and ways of teaching students, this approach highlights teachers have a significant impact on students ' perception of the topic. The study also found that in this approach the attitude towards science varies according to gender, age and cultural factors. In addition, many studies have shown that teaching methods have a significant impact on students ' relationship with the subject (Goldin & Shteingold, 2001). However, in general, Kazakhstan adopted the attitude of students to physics and science that has not yet been studied.

Sheriyev et al. (2016) address the role of human-computer interaction (HCI) systems in education. In the context of robotics in physics education, HCI systems are key to helping students engage directly with robots and digital platforms. By interacting with these systems, students develop a deeper understanding of how technology works, preparing them for careers in fields like AI, robotics, and human-computer interaction.

The role of robotics in increasing activity. Church et al. (2009) showed that robotics is an effective tool for increasing students ' interest in the lesson. When students choose specific technology problems, their creativity is improved, and a deep understanding of the relevance of the discipline is formed (Church et al., 2009). This study aims to test this concept in the context of Kazakhstan's study of the influence of robotics on physics lessons. Further, Mutarah et al. (2024) discuss the development of interactive mobile applications in education, which can play a vital role in making robotics-based physics lessons more engaging and accessible. Such applications can allow students to interact with robots or physics simulations on their smartphones or tablets, making learning more hands-on and accessible both in and outside of the classroom. This technology can also serve as a bridge to careers in app development, design, and technology.

The impact of robotics on career guidance. Cyrus et al. (2014) took advantage of the interest in STEM careers A questionnaire to assess students ' interest in future careers (STEM-GUS). His research highlighted the important role of STEM education in increasing interest in these areas. A new aspect of this research is the study of how robotics works It affects the perception of future careers of students in Kazakhstan, especially in the field of the mint. Gaps in research and the contribution of this study. A review of the literature shows that if important data on the impact of robotics on students ' research skills and career prospects, much of the research work was also carried out outside Kazakhstan. This study was one of the first to bridge this gap study of the impact of robotics on physics education in the Kazakh context. It aims to provide insights into how robotics can influence students' attitudes toward science and their interest in STEM-related careers, thereby contributing valuable knowledge to both local and global discussions on STEM education.

AI-driven robotics tools. The study by Rzabayeva et al. (2024) discusses the role of gamification in promoting digital literacy, demonstrating that gamified learning experiences can bridge the gap between fun and education. When robotics is introduced into physics education, it offers an excellent opportunity to incorporate gamified experiences that can motivate students, increase their engagement, and develop their digital literacy. Similarly, Talgatov et al. (2024) explore the implications of AI in the classroom. AI can enhance

the learning of physics concepts through robotics, offering students interactive simulations and personalized feedback. However, this integration of AI requires careful consideration of its impact on traditional pedagogical practices. Moreover, the research by Kassymova et al. (2019) emphasized the importance of cognitive competence in learning, which is further strengthened through e-learning platforms. Robotics-based lessons, delivered via digital platforms, allow students to engage in problem-solving and critical-thinking exercises. In addition, Muti'ah et al. (2021) highlight the significance of collaborative teaching strategies in schools. The interdisciplinary nature of robotics - where physics, engineering, and computer science intersect - provides a perfect context for teachers from different fields to collaborate and deliver a more holistic education. This collaboration is crucial for ensuring that students see the practical applications of physics in real-world technologies, encouraging them to explore future careers in these domains.

Research Objectives

1. To determine students' interest in physics; to conduct surveys and interviews to assess students' interest in physics and science in general; to investigate the influence of gender, age, and social factors on students' interest in physics.

2. To evaluate the development of scientific research skills through robotics and identify how robotics projects can enhance students' scientific research skills; to assess the impact of robotics on students' research methods and critical thinking abilities.

3. To examine changes in students' perceptions of future careers; to evaluate the influence of robotics on students' interest in future careers; to study changes in students' interest in stem-related professions.

Scientific Novelty

*Impact of Robotics on Interest in Physics***.** This study is the first to analyze the effectiveness of robotics in enhancing school students' interest in physics in Kazakhstan. Unlike traditional teaching methods commonly used in physics classes, this research evaluates how robotics stimulates student engagement and interest, addressing a current and innovative educational challenge.

Influence of Robotics on Mastering Scientific Research Methods. The study investigates the extent to which robotics projects contribute to developing students' scientific research skills and critical thinking abilities. By assessing the impact of robotics on mastering research methodologies, the research introduces a novel perspective within the educational context of Kazakhstan.

Changes in Students' Career Perceptions in Kazakhstan**.** Exploring how robotics influences students' interest in future careers, this study fills a research gap by examining the effects of robotics on career orientation, particularly in STEM-related fields, within the context of Kazakhstan. This innovative approach sheds light on robotics' potential to shape professional aspirations and career interests.

Practical Significance:

1. Students ' interest in physics is growing. The results of this study will help identify effective methods for using robotics to increase students ' interest in physics. These methods allow teachers to introduce new and attractive tools and approaches to physics lessons, increase student motivation, and participate in the learning process.

2. Integration of robotics into the educational process. The study shows practical ways to effectively incorporate robotics into school curricula. This textbook supports teachers and school administrators in using robotics projects in Physics, Mathematics, and engineering classes and promotes the development of practical STEM-based educational practices.

3. Development of research skills of students. The use of robotics in education helps students master scientific research methods, improve critical thinking skills, solve problems, and make innovative decisions. The results of the study allow teachers to provide practical tools and strategies for effective teaching of research methods.

Research Methodology

This study used quantitative research approaches to study students' interest in physics and the MINT direction, as well as the place of robotics in the process of knowledge accumulation. The Tosra questionnaire (review of the points of view of science) was used for data collection (discriminatory validity and validity of the Urdu version of the Tosra test for communication with science in 2013). The Urdu version of this survey,

which has been confirmed and confirmed for students in Pakistan, has been adapted for Kazakhstan. The modified version was adapted to assess the impact of robotics integration on physics lessons in the 8th grade.

The subject of the investigation

The aim of the study as a research object is aimed at students of the 8th grade in Kazakhstan. A total of 195 students from different schools and social groups took part in the study. Their views on physics, science in general and the role of robotics in the learning process were analyzed.

Stages of the study

Preliminary study. Before the start of the studies, a first survey was conducted to determine the student's interest in physics and STEM. The survey is aimed at determining the attitude of students to the topic and assessing the state of their relationship with science before the integration of robotics.

Robot integration

During the study, the stage of introducing robotics into physics lessons was studied. Students used Lego® Arduino kits and other robotic tools to conduct scientific research and solve technical problems. This practical application is aimed at increasing interest in physics and STEM. Post-integration survey. After the integration of robotics, a final survey was conducted. This survey is designed to assess students' changing interest in physics and their attitude towards STEM subjects, in particular by focusing on how robotics affects their interaction with the subject.

Data Collection Tools

1. *TOSRA Survey*. The TOSRA (Test of Science-Related Attitudes) survey was used to assess students' attitudes toward science, physics, and robotics. The survey was structured using a Likert scale:
   - SA = Strongly Agree
   - A = Agree
   - NS = Neutral
   - DA = Disagree
   - SDA = Strongly Disagree

2. *Observation*. The process of students working on robotics projects was monitored by direct observation. Teachers followed the participation of students in group work, their creative abilities and the use of basic concepts of physics during the projects.

Methods for data analysis. The data collected in the questionnaires were analyzed using statistical methods. The Spss software was used to process survey results and evaluate changes in students' interest in physics and robotics. The observation data was compared with survey responses to understand how robotics influenced students' engagement with the subject matter.

*Research Ethics***.** Throughout the study, all student feedback and data were collected anonymously and used solely for academic purposes. Parental consent was obtained for students' participation, and all ethical guidelines were strictly followed.

Research Results

1. *Overall Data.* The initial survey results from 195 students are summarized as follows in Table 1.

Table 1. Initial survey results

Survey Category	*Mean*	*Median*	*Standard Deviation*	*Minimum*	*Maximum*
Social Impact of Science	3.66	3.67	0.443	2.33	4.83
Attitude Towards Scientific Research	3.52	3.50	0.485	2.17	5.00
Interest in Science Classes and Recreation	3.01	3.00	0.365	1.58	4.25
Interest in Careers in Science	3.28	3.20	0.510	2.00	4.60

2. *Statistical Analysis*. Statistical analysis of the collected data revealed that there were no significant differences based on gender, family size, or parental education level. This suggests that factors such as gender or family background did not have a notable impact on students' interest in science or robotics, at least within the context of this study. Here are the statistical analysis results based on family size in Table 2. Statistical Analysis is based on family size (Independent Samples T-Test).

Table 2. Statistical analysis results

Survey Category	*Statistic*	*df*	*p-value*	*Remark*
Social Impact of Science	Student's t	193	0.860	No statistically significant difference
Attitudes Towards Scientific Research Methods	Student's t	193	0.721	No statistically significant difference
Interest in Science Classes and Leisure	Student's t	193	0.259	No statistically significant difference
Interest in Careers in Science	Student's t	193	0.177	No statistically significant difference

3. *The Role of Robotics in Enhancing Engagement*. Church et al. (2009) demonstrated that robotics is an effective tool for increasing students' interest in lessons. When students solve real-life engineering problems, their creativity is enhanced, and they develop a deeper understanding of the subject's relevance (Church, Ford, & Perova, 2009). This study seeks to test this concept in the context of Kazakhstan by examining the impact of robotics on physics lessons.

4. *The Impact of Robotics on Career Orientation*. Kier et al. (2014) used the STEM Career Interest Survey (STEM-CIS) to assess students' interest in future careers. Their research highlighted the critical role of STEM education in fostering interest in these fields. A novel aspect of this study is to explore how robotics influences students' perceptions of future careers in Kazakhstan, particularly in STEM fields.

Research Gaps and Contribution of This Study. The literature review reveals that while there is substantial data on the impact of robotics on students' research skills and career perspectives, most of these studies have been conducted outside of Kazakhstan. This study addresses this gap by being one of the first to explore the impact of robotics on physics education within the Kazakhstani context. It aims to provide insights into how robotics can influence students' attitudes toward science and their interest in STEM-related careers, thereby contributing valuable knowledge to both local and global discussions on STEM education. There are no statistically significant differences based on family size ($p > 0.05$) in Table 3.

Table 3. Analysis Based on Parental Education Level (Independent Samples T-Test)

Survey Category	*Statistic*	*df*	*p-value*	*Note*
Social Impact of Science	Student's t	191	0.203	No statistical difference
Attitude Towards Scientific Research	Student's t	191	0.353	No statistical difference
Interest in Science Classes and Recreation	Student's t	191	0.086	No statistical difference
Interest in Careers in Science	Student's t	191	0.959	No statistical difference

Note**:** There are no statistically significant differences based on parental education level ($p > 0.05$).

Table 4 suggests that parental education level did not significantly influence students' attitudes toward science and robotics.

Table 4. Difference Between Complete and Incomplete Families (Mann-Whitney U Test)

Survey Category	*Statistic*	*p-value*	*Note*
Social Impact of Science	Mann-Whitney U	1623	No statistical difference
Attitude Towards Scientific Research	Mann-Whitney U	1605	No statistical difference
Interest in Science Classes and Recreation	Mann-Whitney U	1503	No statistical difference
Interest in Careers in Science	Mann-Whitney U	1296	No statistical difference

There are no significant differences between full and single parents. (P> 0.05), which suggests that the family structure did not have a significant impact on the attitude of students toward science and robotics.

Table 5. Teacher's Teaching Method and Suggestions for Changing the Lesson

Survey Category	***Statistic***	***p-value***	***Note***
Social Impact of Science	Mann-Whitney U	3143	No statistical difference
Attitude Towards Scientific Research	Mann-Whitney U	3333	No statistical difference
Interest in Science Classes and Recreation	Mann-Whitney U	2544	Statistical difference (p < 0.05)
Interest in Careers in Science	Mann-Whitney U	2641	Statistical difference (p < 0.05)

Table 5 showed significant differences between "interest in science education and leisure activities" and "interest in a scientific career" (p < 0.05). This suggests that the attitude of students toward science lessons and scientific careers may be influenced by the way the teacher teaches, highlighting the need to improve or change the way these aspects are taught.

Table 6. Teacher's Suggestions for Changing the Teaching Method

Survey Category	**Statistic**	**p-value**	**Note**
Social Impact of Science	Mann-Whitney U	2804	No statistical difference
Attitude Towards Scientific Research	Mann-Whitney U	2150	Statistical difference (p < 0.05)
Interest in Science Classes and Recreation	Mann-Whitney U	2012	Statistical difference (p < 0.05)
Interest in Careers in Science	Mann-Whitney U	2335	Statistical difference (p < 0.05)

Statistically significant differences were observed in the categories "Attitude Towards Scientific Research," "Interest in Science Classes and Recreation," and "Interest in Careers in Science" (p < 0.05) in Table 6. This indicates that suggestions for changing the teacher's teaching method have a meaningful impact on students' interest in science and scientific careers. Thus, improving the teaching approach can positively influence students' engagement with these aspects.

Pre-Study Results (Descriptive)

The survey results collected before the study showed that students had an average level of interest in physics and STEM fields. The data is summarized in Table 7.

Table 7. Pre-Study Results

Survey Category	***Mean***	***Median***	***Standard Deviation***	***Minimum***	***Maximum***
Social Impact of Science	3.66	3.67	0.443	2.33	4.83
Attitude Towards Scientific Research	3.52	3.50	0.485	2.17	5.00
Interest in Science Classes and Recreation	3.01	3.00	0.365	1.58	4.25
Interest in Careers in Science	3.28	3.20	0.510	2.00	4.60

The average scores suggest that students had moderate interest in science, scientific research, science classes, and careers in science before the integration of robotics into the learning process. The variability of responses also indicates some differences in student perspectives.

Gender, family size and differences in parenting

According to the results of Mann-Whitney Ut tests and data on the preschool education of students, there was a statistically significant influence of factors on students' interest in science in terms of answers,

family members and parental behaviour. Show it to me (p> 0,05). This shows that these demographic factors did not influence students' attitudes towards science or physics in this study.

Teacher's suggestion to change the way of learning

The teacher's proposal to significantly change educational equity (P < 0.05) was rejected. This shows that students have expressed the need to improve teaching methods to increase motivation and interest in physics. The statistical significance of these results shows that a change in the way students learn can help to increase their motivation and motivation for science lessons.

Results after the study: The effects of robotics integration

After the integration of robots into physics lessons, students' interest in natural sciences and their prospects improved significantly. The results of the survey after the study showed the following changes (Table 8).

Table 8. Results after the study

Survey Category	*Pre-Study Average*	*Post-Study Average*	*Change*	*p-Value*
Social Impact of Science	3.66	4.10	+0.44	< 0.05
Attitude Towards Scientific Research	3.52	4.05	+0.53	< 0.05
Interest in Science Lessons and Breaks	3.01	3.85	+0.84	< 0.01
Interest in Science Careers	3.28	3.74	+0.46	< 0.05

Basic observations

1. The social influence of science: the student's perception of the social significance of science increased significantly (p < 0.05).

2. Attitude to scientific research: students showed a positive change in their attitude to scientific research methods (B < 0.05).

3. Interest in science teaching: Students' interest in science teaching and the subject in general increased significantly (p < 0.01).

4. Interest in a scientific career: The students' interest in a scientific career has also improved (p < 0.05).

These results show that the integration of robotics has had a positive effect on the motivation of students and their general interest in natural sciences and the fields of natural sciences, technology, engineering and mathematics.

Pay attention to the lessons. The use of robots has significantly increased the interest of students in physics lessons. 85% of students said that courses with experiments and engineering projects are interesting and valuable.

Impact of Changes in Teaching Method. The changes in the teacher's instructional approach positively affected students' participation. The use of robotics elements in lessons enhanced students' activity in group work and strengthened their practical skills.

Final analysis

A comparison of the results before and after the study showed the effectiveness of integrating robotics into physics lessons. This method has helped to arouse students' interest in the subject, develop scientific thinking, and increase interest in future careers in science and technology. Finally, the introduction of robotics has proven to be a successful learning tool to increase students' activity and deepen their understanding of the concepts of physics.

Research Discussions

The results of the study showed that the integration of robotics into physics classes plays an important role in increasing students ' interest in the natural sciences, especially in the areas of Science, Engineering, Engineering and mathematics. In this section, we will analyze the results of

the study, paying special attention to the effectiveness of the introduction of robots into the educational process and their influence on the selection of students for future specialties.

1. Increased interest in science. At the beginning of their studies, students ' interest in physics, Natural Sciences, Engineering, Engineering and mathematics was moderate. According to the results of the survey, although most students had a positive attitude towards science, many did not find physics classes particularly attractive. However, after the introduction of robots in the classroom, interest in this topic increased significantly. Interest in teaching natural sciences and leisure activities increased from 3.01 to 3.85 ($p < 0.01$), and interest in natural sciences increased from 3.28 to 3.74 ($p < 0.05$).

These results demonstrate the effectiveness of integrating robots into physics lessons to increase students ' interest in the topic. Robotics allowed students to complete tasks according to specific scenarios and helped them understand the theoretical aspects of physics through practical experience. This method not only deepened their understanding of the topic but also developed practical skills. In the final survey, 85% of students said that the classes were interesting and that the experience of working with robots was valuable.

2. The role of the teacher's pedagogical approach. The study also showed that the teacher's teaching method has a significant impact on students ' interest in the subject. Before studying, students realized that it was necessary to update the methods of the teacher. After graduation, most students came to the opinion that it is necessary to modernize teaching methods. This shows that teachers need to think about introducing innovative teaching methods, including robotics, into their classrooms. Most of the students responded positively to the proposal to change the teaching methodology and showed their willingness to use updated teaching methods to improve the effectiveness of teaching. These results indicate the need to improve the quality of teaching by introducing robots into teacher training practices.

3. The influence of Robotics on interest in Science, Engineering, Engineering and mathematics. The introduction of robotics in physics classes increased students ' interest in Science, Engineering, Engineering and mathematics. Interest in careers in science increased from 3.28 to 3.74 ($p < 0.05$), indicating that students ' interest in careers in Science, Engineering, Engineering, and mathematics increased. This shows that integrating robotics into physics classes not only helps students develop their scientific and engineering skills but also changes their perspective on future career opportunities. With the help of robots in the classroom, students were able to work creatively in solving specific technical problems, which increased their motivation to participate in scientific research and projects. According to the final survey, 70% of students said they had an increased interest in science, technology, engineering and mathematics, and 50% wanted to work in physics and engineering.

4. Future views and suggestions. This study showed that integrating robots into physics lessons is an effective way to increase students ' interest in the subject. However, since research is limited to 8th-grade students, future research may expand the field of assessing the effectiveness of using the robot in classrooms and other educational institutions. In addition, the study of the integration of robotics with other sciences, technologies, engineering and mathematics helps students improve their general scientific knowledge and form the choice of a future profession. It is also recommended to support the effective use of robots in the classroom and organize additional training for teachers, as well as develop specific teaching guidelines. This will allow teachers to apply new techniques more effectively and will help increase students ' interest in the topic.

Conclusion

The research results show that the introduction of robots in physics lessons has significantly increased students' interest in the natural sciences and changed their attitude toward future careers. Teachers and educational institutions should comprehensively use innovative methods, including the use of

robotics, to increase student participation in science, technology, engineering and mathematics. This method helps students to develop their research skills, strengthen their creative abilities and increase their confidence in the professional future.

The main conclusion

1. Interest in physics. The introduction of robots in physics lessons helps to increase students' interest in this subject. According to the research results, interest in physics increased from 3.01 to 3.85. This change proves that robotics allows students to combine science with real problems.

2. Interested in natural sciences, technology, engineering and mathematics. The introduction of robotics into physics courses has led to an increased interest in the fields of natural sciences, technology, engineering and mathematics. The interest of students in scientific disciplines increased from 3.28 to 3.74, which shows that robotics strongly attracts students of engineering and natural sciences.

3. Teacher's teaching method. Changes in the teaching methods of teachers have led to an increased interest of students in this subject. The students pointed out that the use of robots in the classroom helps to deepen knowledge and develop creative abilities. This underlines the importance of modern teacher training methods.

4. Career guidance. The study shows that students are more interested in natural and technical sciences, engineering sciences and mathematics. The use of robots has expanded the horizons of the future careers of students. 50% of students noted the impact of robots on career guidance and said they wanted to work in the fields of physics and engineering.

Practical significance

The results of this research confirm that the integration of robots into physics courses is an effective way to develop knowledge of science, technology, engineering and mathematics. This method helps students to develop research skills, improve technical thinking, and increase confidence in future career choices. With the help of robots, teachers can provide students with a practical and interesting way to understand complex scientific concepts, which will make the fields of science, technology, engineering and mathematics more accessible and attractive.

Further research recommendations

1. Extensive integration of robots. It is very important to improve the methods of introducing robots into physics lessons and introduce them into the school curriculum. This allows students to gain practical knowledge and expand their understanding of scientific concepts, making physics more attractive and accessible.

2. Additional research. In order to more deeply study the influence of robots on the learning process, it is necessary to conduct long-term research. In addition, studying the integration of robotics with other natural, technological, engineering and mathematical sciences can help students improve their general scientific knowledge and raise awareness of their career choice.

To sum up, it can be said that the integration of robotics into physics lessons has significantly increased students' interest in the natural sciences and broadened their perspective on their professional future. This approach plays an important role in the development of scientific, technological, engineering and mathematical education, and contributes to the improvement of the education system. By developing creative and practical skills, robotics helps students combine theory with real-world applications and prepares them for future challenges in the scientific and technical fields.

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