

INVESTIGATING THE IMPACT OF A WINTER SCHOOL ON ARTIFICIAL INTELLIGENCE AND ROBOTICS EDUCATION: A CASE STUDY FROM TASHKENT

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Abstract. This study explores the outcomes of a Winter School event held from January 6-10, 2025, at the Turin Polytechnic University in Tashkent. Organized in collaboration with the Korea National Transport University (KNUT), the Republic Scientific and Methodological Center for Education Development, and the Turin Polytechnic University, the program aimed to introduce the basics of Artificial Intelligence (AI) and Robotics to 10th and 11th-grade students and Information Technology (IT) teachers from 12 schools in Tashkent. The event facilitated by Korean experts offered hands-on training sessions for 24 students and 13 teachers. This paper investigates students' interest in learning AI and Robotics, evaluates teachers' feedback on the training, and examines the effectiveness of project-based teaching methods using Pearson's method.

Keywords: *Artificial Intelligence, Robotics, Project-Based Learning, STEM Education, Teacher Training, International Collaboration*

Introduction

The rapid advancements in Artificial Intelligence (AI) and Robotics have made their inclusion in education a priority for preparing future generations. This study focuses on a Winter School event that aimed to foster foundational knowledge and practical skills in AI and Robotics for high school students and IT teachers in Tashkent. Organized collaboratively by international and local institutions, the program highlights the benefits of cross-border educational initiatives and innovative teaching methodologies.

Methodology

The Winter School took place over five days, with sessions facilitated by Korean experts from KNUT. A total of 24 students and 13 IT teachers participated, representing 12 schools from Tashkent. The program included:

- Interactive lectures on AI and Robotics fundamentals.
- Practical, hands-on training sessions.
- Collaborative projects employing project-based learning methodologies.

Modern methodologies have shifted towards student-centered learning. Techniques such as project-based learning (PBL), inquiry-based learning (IBL), and flipped classrooms are increasingly being adopted in AI and Robotics education [1].

In modern methodologies, students develop a wide range of skills such as critical thinking, teamwork, and creativity. Traditional methods, while effective for building foundational knowledge, often do not provide opportunities for students to apply what they have learned in real-world scenarios [2].

In our previous research we conducted the survey among 735 students, 542 parents, 33 ICT teachers, and 12 school principals in Tashkent to assess the current state of AI education and to gauge their perspectives on the effectiveness of traditional versus modern methodologies [3].

Data Collection

Surveys were conducted at the end of the program to collect feedback from participants. Students and teachers rated their experiences on parameters such as content relevance, engagement, and overall satisfaction. Teachers also provided qualitative feedback on the applicability of the training in their teaching practices.

Data Analysis

Survey data were analyzed to identify trends in students' interest and teachers' perspectives. Pearson's correlation method was applied to evaluate the effectiveness of the project-based teaching method in enhancing engagement and learning outcomes.

Results and Students' and Teachers' Feedback

All students reported gaining new experiences and skills in programming and AI. A significant majority, 96.4%, expressed increased interest in further education related to programming or AI after the Winter School. 75% of students indicated a growing interest in automating processes, while 22% expressed aspirations to become specialists in the field. Students affirmed that additional education in AI and programming would positively influence their future career opportunities.

Students appreciated the practical experiences and found the topics to be both interesting and useful. Many suggested dedicating more time to developing advanced topics and projects.

Teachers highlighted the strong interest in AI and Robotics among students and emphasized the importance of increasing the coverage of these subjects in the curriculum for Informatics and Information Technology. They also praised the structure of the Winter School, noting that breaking projects into smaller groups helped foster collaboration, problem-solving, and critical thinking skills. Teachers agreed that such activities should be integrated into the existing curriculum to encourage teamwork and address real-world challenges.

Student Testimonials

"We gained a lot of knowledge and skills in Open-CV."

"I learned to install Spyder, Vs code, and OpenCV, as well as how to work in directories and use Python 3.0 to detect objects using AI."

"In this Winter School training, I learned about Python, OpenCV, and how to create virtual environments. This knowledge was solidified through practical coding exercises."

"I learned about the basic principles of programming, algorithm creation, and effective use of technologies. It has increased my interest in the IT field."

"I now understand how AI can be applied in real-world processes and its significance in modern technology."



Figure 1. The training session in the Winter school program in Tashkent

The training introduced AI and Robotics basics and software principles. Students worked on creating various projects using AI tools and robotics kits. Group work played a significant role in the development of collaboration and problem-solving skills. Students were divided into groups to complete projects, increasing their capacity for teamwork and enhancing their communication skills. The program also aimed to inspire students to pursue additional education in computer engineering and continue their professional development in the field.

Effectiveness of Project-Based Learning

The application of Pearson's method revealed a strong positive correlation ($r = 0.85$) between project-based learning and increased student engagement and understanding. The findings underscore the effectiveness of hands-on, project-based learning in teaching complex subjects like AI and Robotics. The collaborative effort between KNUT and local institutions ensured culturally and pedagogically appropriate content delivery. Teachers' positive feedback suggests a multiplier

effect, as they plan to incorporate the training methodologies into their regular curricula.

This pilot project was organized to shape the concept for the Korea International Cooperation Agency (KOICA)'s ODA grant program. The experience gained during this Winter School will help inform the proposal for the future project, which is planned to be financed by Korea. The project aims to be tested in Tashkent city and Tashkent region for five years, and will ultimately contribute to enhancing AI and Robotics education for high school students and teachers across Uzbekistan [4].

The training was successful in developing new skills in AI and Robotics, and it has shown a promising response from both students and teachers. Moving forward, the program's expansion and further integration into the national education system could greatly benefit students in Uzbekistan by equipping them with the skills needed for the digital economy and future career opportunities in AI and robotics fields [5].

Conclusion

The Winter School event demonstrated the potential of international collaboration in advancing STEM education. The program's success highlights the importance of integrating project-based teaching methods and practical learning experiences to enhance student and teacher engagement. Future initiatives should focus on scaling such programs to reach more schools and include long-term impact assessments.

Recommendations for Future Implementation

Extend the duration of the Winter School to cover more advanced topics. Introduce more hands-on project work to allow deeper learning of AI and robotics principles. Incorporate more international collaborations and training from experts in the field to broaden the scope of learning. Ensure continuous support and resources for both teachers and students to stay updated with the latest technological

advancements. This report highlights the success of the pilot project and provides a roadmap for the future implementation of AI and Robotics training in Uzbekistan.

References

1. Abdusalilov J. A. Survey analysis for teaching artificial intelligence and robotics in general secondary education // Berdaq nomidagi Qoraqalpoq davlat universitetining Axborotnomasi, 2024, 2 (65). B.17-22. (13.00.00; №13)
2. Abdusalilov J. A. Analyzing the effects of teaching methodologies of basic AI and robotics topics for graduating students of general secondary education // Fizika, matematika va informatika jurnali, 2024, 5/1. B.102-108 (13.00.00; №2)
3. Abdusalilov J. A. Comparative Analysis of the Results of Teaching AI and Robotics for School Students // Bulletin of the Technical Committee on Learning Technology, 2024, Volume 24, Number 1, p.p.29-34 (13.00.00; JIF:0.3) (Web of Science)
4. Zakirova F.M., Abdusalilov J.A. Informatika va axborot texnologiyalari fani mazmunini sun'iy intellekt va robototexnikaga oid mavzularni kiritish asosida takomillashtirish // Natijaga yo'naltirilgan uzluksiz ta'limni joriy etish tendensiyalari xalqaro ilmiy-amaliy konferensiya, Toshkent 2024, B.350-358.
5. Abdusalilov J.A., Ahmadaliev D., Ryum-Duck Oh. The Effects of Teaching AI and Robotics for High School Students: A Case Study in Uzbekistan // The importance of the digital economy and artificial intelligence technologies in the development of society, International scientific and practical conference, Toshkent 2024, B.43-48.

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Appendix

1. Introduction

(1) Purpose

Through a global education cooperation project with TTPU University in Uzbekistan, A.I and software education is taught for university, high school, and middle school students in Tashkent. Based on this, it nurtures future A.I scientists in Uzbekistan and strengthens students' capabilities.

(2) Date: 2025.01.06(Mon.) ~ 10(Fri.)

(3) Venue: Training Room, Turin Polytechnic University, Tashkent, Uzbekistan

(4) Operation Team: KNUT and TTPU Global Education Team

(5) The Number of Student: 24 Students (Teacher+Student)

2. Time Schedule

-Lyceum Student + Teacher

(Jan. 06, 2025)

Date	Time	Topic	Detailed Contents
01.06. (Mon.)	10:00 ~ 10:30	Registration	-
	10:30 ~ 11:00	Orientation	Introduction to Pilot Training Camp
	11:00 ~ 12:00	Training	OpenCV Installation and testing
	13:00 ~ 14:00	Training & Coding	Coding and Execution
	14:00 ~ 15:00	Practice	Coding Practice
	17:00 ~		

(Jan. 07, 2025) - (Jan. 10, 2025)

Date	Time	Topic	Detailed Contents
01.07 (Tue.) ~ 01.10 (Fri.)	10:00 ~ 11:00	Training	OpenCV Tools and coding(1)
	11:00 ~ 12:00	Training	OpenCV Tools and coding(2)
	12:00 ~ 13:00	Break	
	13:00 ~ 14:00	Practice	Practice, Coding and Execution(1)
	14:00 ~ 15:00	Practice	Practice, Coding and Execution(2)
	17:00 ~		

Figure 1. Detailed agenda of the Winter School program in Tashkent.

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O'qituvchi va o'quvchilarning "Qishki maktab"da Sun'iy intellekt asoslarini o'rganish bo'yicha fikr mulohazalari

Toshkent shahrida joylashgan 12 ta tumandan tanlab olingan 12 ta maktabning Informatika va AT fani o'qituvchilari hamda bitiruvchi sinf o'quvchilariga Sun'iy intellekt asoslarini o'qitish maqsadida Qishki trening mashg'ulotlari o'tkazildi. Mashg'ulotlardan avval o'quvchilarda dasturlash va sun'iy intellektni o'rganishga ehtiyoj mavjudligini aniqlash so'rovnoma o'tkazildi.

Shundan so'ng, 1 haftalik 2025 AI-SW nomli Qishki trening dasturi o'tkazildi. Unda sun'iy intellekt asoslariga oid mashg'ulotlar olib borildi.

Quyidagi so'rovnoma ushbu trening dasturi o'quvchilarning texnologiyaga nisbatan qarashlariga qanday ta'sir ko'rsatganligini aniqlaydi. So'rovnoma savollari treningdan avvalgi so'rovnoma mazmuniga asoslanib tuzilgan.

aaotemirov@gmail.com [Switch account](#)

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The banner features logos of the Ministry of Education, NRF, and the Ministry of Science and ICT. It includes a map of Uzbekistan and the text "Wintep Cam 2025". The main title is "AI-SW Pilot Training". Below it, the subtitle reads: "The Education-Cooperation Project for the Development of Educational Content and AI-SW Education Models to Foster Future AI Scientists in Uzbekistan". Logos for AUGUR, ChatGPT, and Orange3 are at the bottom left. A date "January 06 - 10 2025" is at the bottom center. A cartoon robot is at the bottom right.

Figure 2. Sample from the survey questionnaire page.



Figure 3. Certificate template awarded to participants.

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