

GENERATION AI

EDUCATIONAL PROGRAM

OPPORTUNITY

AI presents a transformative opportunity in today's society, with a projected global market value of \$459.3 billion by 2030¹. It is a platform technology that can be applied across various industries, offering resilience during crises. According to McKinsey Global Institute, AI adoption is expected to grow, with around 70% of companies adopting AI technology by 2030, potentially delivering an additional economic output of \$13 trillion and increasing global GDP by 1.2% annually.

At the same time, the talent shortage worldwide has been consistently highlighted as a vital issue for AI expansion. Since 2016, the leading countries competing in the AI market have already designed AI programs to educate and sustain the best and brightest AI talents from an early age. China has been one of the best cases of centrally integrating and instituting AI education in K-12 education since 2017. Regardless of those efforts, the global shortage still remains.

In this context, Armenia has an opportunity to participate in the development of globally competitive AI researchers and engineers. Armenia has a strong global comparative advantage in mathematics and natural sciences — even more so than in ICT. Armenia's graduates from ICT-related courses and natural sciences, mathematics, and statistics (NSMS) surpass the global averages and outperform many of its regional competitors.

PROBLEM STATEMENT

With the current economic growth rate, Armenia will require more than 500 years to reach the level of the current top 10 innovative countries. Therefore, Armenia needs leapfrogging (**e.g., 16.7% annual growth rate for the next 20 years**). The unfavorable geopolitical situation and scarce natural resources mean Armenia cannot leapfrog with traditional economic means.

To address this, Armenia must invest in human capital, including education, healthcare, and the social sphere, which accounts for a significant portion of potential capital shares. Currently, Armenia's average labor productivity (GDP per hour worked) is \$19.8, far below developed countries' level of \$94. Public financing of education is also low at 2.14% of GDP (in 2021), well below the average of upper-middle-income countries (3.9%).

Furthermore, only a small portion of public expenditures are directed towards higher education, contrasting with the higher rates seen in OECD and developed countries. The human capital index (HCI) indicates that a child born in Armenia today will be only 58% as productive as they could have been with full access to health and education services. Therefore, Armenia must significantly increase its investment in education to enhance its human capital, leading to long-term economic growth. Armenia's human capital index (HCI) measured shows that a child born in Armenia today will be only **58% as productive** as they could have been **if they had received the full set of health and education services available**.

Therefore, Armenia has to significantly increase its investment in education to develop its human capital, bringing long-term economic growth increase. Additionally, instead of spreading resources thinly across multiple sectors, directing efforts towards niche areas where Armenia has a competitive advantage can yield better outcomes.

¹Artificial Intelligence (AI) - [Global Market Trajectory & Analytics \(2022\) report](#) // Global Industry Analysts, Inc

Armenia has a strong global comparative advantage in natural sciences, mathematics, and statistics (NSMS). The following table represents the number of tertiary graduates per 1,000 individuals:

	Armenia	Global Average
ICT-related courses graduates	0.38	0.32
NSMS graduates	0.6	0.36

At the same time, until recently, there have been few commercial opportunities for mathematicians in Armenia, but AI research has created high demand for mathematicians globally. Along with that, Armenia is facing a **shortage of AI-related graduates**. The causes are the lack of an education pipeline and ecosystem, hindering its competitiveness in the global market.

Notably, Armenia **does not have a dedicated Ph.D. program in AI**. Instead, doctoral degrees in AI are obtained through AI-related programs. In the field of computer science, the percentage of graduates specializing in AI/ML is 6.7% for bachelor's degrees and 8.4% for master's degrees in Armenia. This proportion is lower compared to the global average of 22.8% for Ph.D. programs in AI.

Armenia's AI education is hindered by a **lack of strong foundational education in mathematics and computer science at the school level**, with approximately a quarter of students failing the state graduation math exams². Furthermore, there is a **concentration of exemplary practices in only a few specialized schools located in Yerevan**. Only **5 Universities offer AI-related degrees** (the share of AI programs in the total number of programs is 0.84%, and AI-related programs (including math and computer science) is about 9% according to the Ministry of Education, Science, Culture and Sports of RA). However, the number of students entering AI programs remains low. Additionally, **Armenia's academic track record in AI publications is considered poor, with only 76 publications in AI** subject categories from 1996 to 2021, placing Armenia on 116th position out of 195 countries according to the Scimago Journal and Country Ranking³. Moreover, the thriving **IT sector further exacerbates the issue by recruiting top mathematical talents directly from high school**, leading to a decline in university enrollment and discouraging further education.

To enhance global competitiveness, Armenia needs to prioritize AI development from the secondary education level, improve math and computer science education, popularize AI careers, especially in research and innovation, and establish industry-connected education pathways.

SOLUTION

FAST has designed the "Generation AI" program to **create an educational and career pipeline of AI researchers and innovators**. It aims to develop the critical mass equipped with the knowledge and skills critical to succeed in the AI-driven reality and support the country's global competitiveness.

The interventions are planned for all levels of the education system:

- **Generation AI: High School Project** - The main program starts from the high school level, and some interventions are planned for middle school in regard to math and prof orientation starting from the 7th-8th grades.

² <https://escs.am/am/news/9063>

³ [SJR - International Science Ranking \(scimagojr.com\)](https://scimagojr.com)

- **Generation AI: BA Project** - Revision of the current programs and the development of the new courses are planned in several universities to ensure the pipeline and diversification of the specializations. Focus on project-based learning during the first years of study and involvement in local and international research projects as Intern Researcher.
- **Generation AI: MA Project** - Revision of the current program, development of the new ones, concentration on research projects. Opportunities for involvement in local and international research projects as Junior Researchers.
- **Generation AI: Doctorate Project** - new program development and creation of possibilities for doing industrial R&D.

Designed in partnership with the Ministry of Education, Science, Culture, and Sports of the Republic of Armenia, as well as with active involvement of NGOs, academia, and industry professionals, Generation AI's integration into the public education system will ensure future sustainability and be a step toward systemic changes in education with long-term benefit for Armenia's research and technological capacity.

The program will serve as a model for robust public-private partnerships and allow us to introduce best educational practices and international standards to Armenia. The first phase of the program involves a pilot program in high schools.

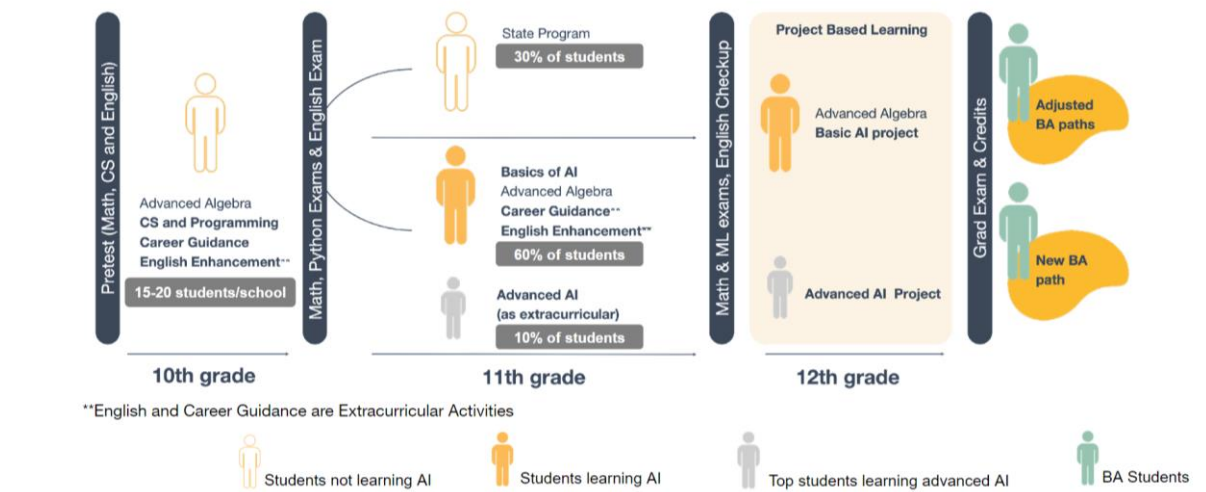
Generation AI: High School Project

The Generation AI: High School Program is the driving force behind the entire initiative, providing the foundation for the various other stages and planned scaling. The high school stage introduces a special curriculum and teaching methodology to prepare students for further education and careers in AI and related fields.

The main goal of the "Generation AI: High School" project is to enhance high school students' competencies and motivation to pursue an AI researcher's and innovator's career. As a result, the following objectives have been established:

- Nationally provide the prerequisite competencies in math and computer science needed for learning AI.
- Nationally raise students' literacy and motivation towards AI and math-based research careers with the help of prof orientation programs.
- Implement differentiated (basic and advanced levels) AI education for those interested in the domain and facilitate credit transfer to Universities.

The trajectory of the students is presented below:



The pilot stage of the high school project starts in September 2023 and involves 16 high schools in Yerevan and 6 regions.

Generation AI: High School Curriculum and Courses

The following courses are defined as mandatory components of the curriculum:

- 1.1. **Advanced Math** course that aligns with the state curriculum for "Algebra and Math Analysis" and follows the methodology developed by FAST. This ensures that students gain practical knowledge and are well-prepared for studying artificial intelligence.
- 1.2. **"Computer Science" (Python programming)** and **"Artificial Intelligence"** are elective courses offered based on the curriculum and methodology developed by FAST.
- 1.3. **AI Project** to be implemented at the last grade of the study.

As part of the Generation AI: High School Project, FAST also organizes extracurricular programs focused on **career guidance** and improving **English skills**.

Budget (Generation AI: High School Pilot Project)

The 3-year budget of the Generation AI High School Pilot Project to be implemented in 16 high schools is about **2,3 mln USD dollars** that include:

- Curriculum and educational resources development
- Teaching staff training and remuneration
- Career guidance & English enhancement programs development and implementation
- School informatics labs facility enhancement

Program Quality Assurance and Multilayer Validation

To ensure that the program meets the highest international standards and effectively addresses Armenia's specific needs, we follow a comprehensive validation process.

The **working group** develops resources and programs that incorporate both global best practices and local requirements. These resources are then reviewed by a **task force** consisting of experts from academia and industry, while an **advisory group** guides us on more strategic matters. This rigorous approach ensures that our program is tailored to deliver the maximum quality and participation of field specialists.

IMPACT

The implementation of the Generation AI program will have several long-term outcomes, including:

- **Nationwide improvement of K-12 math (advanced algebra) performance** on an international level,
- **Access to AI education on a national level** through enhancement of domestic educational institutions and introduction of new educational technologies,
- **Increased advanced knowledge in AI** since the program targets a goal of up to 10-15% of all high school students having a solid understanding of the foundations of AI by the time they complete high school. This will ensure a broader base of students with fundamental AI knowledge and help further build the pipeline at the university level,
- **Growth in Applicants for AI-Related Programs:** As a result of the program's influence, there will be an increase in the number of applicants for diversified AI-related programs at the bachelor's and master's levels,
- **Significant rise in the number of AI Researchers and Innovators,**
- **Enhanced AI literacy among broader stakeholder groups on a national level,** ensuring that more individuals will be equipped with the knowledge and understanding of AI's potential.

The Key Performance Indicators (KPIs) for the Generation AI High School Pilot Project over 3 years are as follows:

- 16 high schools located in Yerevan and the regions integrated in the program,
- Around 50 high school math and computer science teachers and industry specialists in Python and machine learning trained,
- 400 10th grade school students involved,
- Scale-up plan structured and prepared for parallel implementation in collaboration with the government.

During the pilot project, the government and FAST will be developing the scale-up plan and preparing it for implementation in most of the high schools of the country to be accessible for the greater number of high schoolers. This will include training teachers, preparing infrastructure and resources, as well as conducting the necessary policy reforms.

Global Outlook

In structuring this program, macro-level goals and indicators have been our constellations both in determining where we are and where we need to go. In that context, we focus on assessing the impact of the program on the following international indexes: the Global Innovation Index (GII), AI index, and the United Nations Sustainable Development Goals (SDGs). The first two are the key indexes assessing countries in terms of their level of innovation and also progress in AI education and R&D, while UN SDGs provide a broader perspective to tackling global challenges faced by peoples and nations.

The Generation AI program also contributes to the GII of the country by influencing the following pillars:

Human Capital and Research:

- 2.1.4 PISA scales in reading, math and science
- 2.2.2 Graduates in science and engineering, %
- 2.3.1 Researchers, full-time equivalent (FTE) per million population
- 2.3.2 Gross expenditure on R&D, % GDP

Business Sophistication:

- 5.1.2 Firms offering formal training
- 5.2.1 University/industry research collaboration,
- 5.2.3 Foreign-financed gross expenditure on research and development (GERD) financed by abroad, %
- 5.3.5 Research talent in business enterprise / thousand population %

Knowledge & Technology Output

- 6.2.2 New business / thousand population 15–64

The Generation AI program also contributes to the Global AI Index (Tortoise) by affecting:

- Number of universities offering AI or closely associated courses through increasing the number of degree and non-degree programs in AI & Data Science,
- Total AI private investment,
- Number of AI startups received grants and total amount.

The Generation AI program also aligns with the UN's SDGs, primarily impacting:

- SDG 4: ensure inclusive and equitable quality education and promote lifelong learning opportunities for all,
- SDG 17: strengthen the means of implementation and revitalize the global partnership for sustainable development.

These are all important key performance indicators for Armenia, impacting its international positioning as a hub for innovation. Currently, the country's outputs in each of these areas are limited and in many aspects, lower than the world average. By implementing this program, the country's performance in those areas will be significantly improved, thereby boosting Armenia's positioning in the region as an emerging innovation hub.