THE ROLE OF WOMEN IN STEM EDUCATION SYSTEM IN UZBEKISTAN

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Abstract. *This article is dedicated to analyze the sustainable development of STEM programs in education system in Uzbekistan, scale of the female who are studying and working in this field based on official statistics and recent researches. Also, the article analyze the main reasons of not choosing STEM and it is factors that influence on it as well as recommend theoretical and practical solutions for solve them.*

Keywords: *STEM, gender equality, public mentality, cultural norms, educational programs, socio-cultural stereotypes, digital literacy, engineering, IT, local and international organizations, employment rate, sustainable development.*

Recently, the STEM (science, technology, engineering, and mathematics) system has been developing among the modern fields that ensure the development and economy of the state around the world. STEM includes science, technology, engineering, and mathematics and connects them directly with digital technologies. Also, this field makes a positive contribution to the economy, education system, and sustainable development of the country. So, what is the percentage of females studying and working in public institutions of Uzbekistan in the STEM system? In general, do women in our country have the choice of higher education courses in their own hands?Currently, a number of initiatives are being carried out in the world in order to develop this field and increase the personnel base; for example, in Uzbekistan, the necessary measures are being taken together with the responsible organizations and research centers and within the framework of various projects. Despite these many reforms and innovations, not only in our country but also among the countries of the world, there is a gender gap and a small number of women in STEM. According to UNESCO 2021 data, only 28% of graduates in engineering, 40% in computer literacy, and 22% in artificial intelligence were women (Figure 1). In Uzbekistan, the indicator in this regard is also at a lower level, and in 2020, women graduating in STEM fields made up 30.1%. But the high percentage belongs to biology and chemistry (about 55-60%). In the fields of engineering, software engineering, and digital technologies, lower indicators were recorded.

Name of fields	Percentage of female
1.Engineering	28%
2.Computer literacy	40%
3.Artificial intelligence	22%

(Figure 1). Percentage of female graduating in STEM fields according to UNESCO statistics 2021

This gender gap is even more pronounced when looking at universities specializing in the STEM field. For example, 959 (10%) of the total undergraduate students at Tashkent State Transport University are female; however, 89% of students at Tashkent State Technical University are male. These indicators are recorded not only in the universities located in Tashkent but also in the regions. In particular, 87% of male and 13% of female students study at the Bukhara Institute of Engineering and Technology. On the contrary, female students predominate in language and education majors specializing in a number of social sciences. As an example, 84% of the total students of Tashkent State University of Uzbek Language and Literature are women. The Tashkent State Pedagogical University named after Nizomiy made 74% in this regard. Indicators in regional universities and university branches are almost the same. Take Samarkand State Institute of Foreign Languages as an example: 71% of the total students are girls.

Not only among students studying in the field of STEM, but also the number of women working in public organizations and companies, private firms, is lower than that of men. For example, in Uzbekistan, the majority of employees in IT companies are men, and only 25-30% are women. Also, in labor activities, it is almost the same as in higher educational institutions; that is, 68% of pedagogues in public schools are women, and their main specialty is language and social sciences. However, 44.1% of women work in higher education institutions, where the salary level is higher and also requires excellent knowledge and experience.

There are a number of reasons why women do not choose STEM fields and, in most cases, prefer language and social fields. First of all, socio-cultural stereotypes can be a clear example of this. In many regions and families, the concepts and ideas that "engineering, technology, and technical fields are only for men" are established, and girls' families and parents recommend they choose education, medicine, and social fields from a young age and create psychological shells and restrictions for them. In addition, the relatively small number of female scientists, engineers, and IT

professionals who can act as role models and be a source of motivation specifically in the STEM field reduces the interest of girls in this field. Also, deficiencies in the educational system, economic problems, and family issues have their influence on this matter.

The lack of gender standards in school textbooks, the lack of programs that attract girls to STEM, the small number of women among science pedagogues, and the shortage of high-quality special laboratories for practical research and experiments create problems for girls to study this field in depth. Although STEM education in private educational institutions and educational centers is of high quality and interesting, economic problems, due to the majority of such institutions being located in urban centers, create a number of obstacles for girls to participate. Another important issue is that even though women are educated in STEM-related fields at the undergraduate level, family responsibilities and child-caring make it difficult for them to continue their studies and work in this field. Because of this, very few women who graduate from STEM each year work in their professions. As a result of such reasons, the unemployment rate among women in the country increases. As evidence, according to 2020 data, 43% of unemployed women cited household chores as the reason for not looking for work and explained that they are engaged in raising children, but the indicator in this regard for men showed only 7%. Also, the level of employment among women in Uzbekistan is 52%, mostly single women.

In order to solve and prevent such problems and involve females in the field of STEM, several international and local organizations are presenting effective projects in countries, for example, in Uzbekistan, in particular, within the framework of the 5th strategy of the UN's Sustainable Development" Goals—"Ensuring Gender Equality," the Ministry of Digital Technologies, and the Ministry of Higher Education, Science, and Innovation of the Republic of Uzbekistan.

As an example, projects such as "TechGirls," "Girls in STEM," and "Raqamli avlod qizlari"("Girls of the digital generation") have been created, which provide opportunities for girls to improve their knowledge in the field of IT and digital technologies, and efforts are being made to attract girls to these fields. On February 11, 2025, the international forum held in our country on the occasion of the "Day of International Women in Science" noted the importance of the role of women in science and modern professions. Also, presidential assistant Saida Mirziyoyeva emphasized that women make up 48% of the country's scientific community.

However, more systematic projects, resources, and strategic initiatives are needed to improve women's participation in modern occupations, education, and performance in STEM fields. First of all, the population should change social opinion, in general, the public mentality towards these fields in society regarding the choices of girls in this field. It is necessary to prove to them that STEM is not just a "man's world," and role models who are achieving high levels and success in the field without breaking the

cultural norms should be shown through mass media for support girls emotionally. Secondly, it is important to further develop the quality of education in accordance with international and gender standards and to integrate the STEM field together with other subjects in education to organize classes in an inclusive manner. Thirdly, it is necessary to increase the rate of admission of girls to these fields in higher education and increase the level of grants to them. It is appropriate to hold competitions within the republic in this field every year for the female students who are studying in universities and to allocate grants to the most worthy ones to go to internationally renowned universities, research centers, and organizations in the partner and world-leading countries to improve their theoretical and practical knowledge. The reason is that after they return from the exchange programs, their passion for their professions will increase, and they will put the experience they have brought back into practice.

It should not be forgotten that it is important to organize online educational platforms and mentoring systems in the STEM field for women with family obligations or physical disabilities, to monitor the educational processes of students, and, at the same time, to analyze employment indicators after completing the program.

In conclusion, by developing the percentage of women in the STEM field in our country, not only the social activity of females, their place in education and society will be increased, the unemployment rate among women will be reduced, but it will also serve the country's economy, sustainable development, and increase its competitiveness in the international arena.

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