SKILLS GAP STATISTICS FOR BULGARIA

Project: Career Accessibility for Resilient Employment in STEMM (CARES)
2020-1-UK01-KA201-078909

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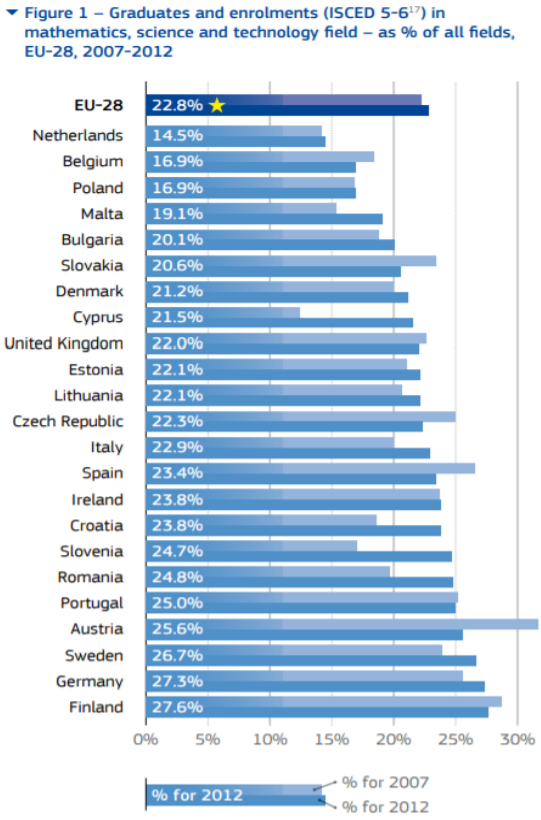
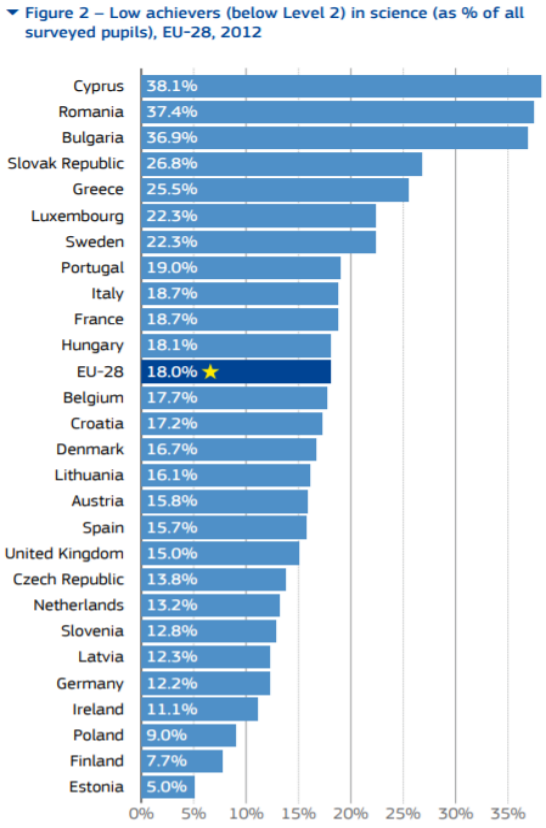
Introduction

The aim of the Skills Gap Statistics report, part of project Career Accessibility for Resilient Employment in STEMM (CARES) with project code: 2020-1-UK01-KA201-078909, is to highlight the current situation with the STEMM education in Bulgaria. The data is collected from trusted European sources and analyzed in a way that represents the skills and knowledge in STEMM of the young people in our country. The time frame is rather broad because not enough information is available to the audience for the most recent situation in Bulgaria.

The STEMM industry- skills and knowledge of the Bulgarian graduates

According to the EU reports, the abbreviation represents the skills in science, technology, engineering, and Maths that graduates with sufficient educational level should possess. They are highly valued by many employers from different sectors of the economy (EU SKILLS PANORAMA 2014, 2015). The understanding of the STEM subjects however differs from country to country. Focusing on the statistical data for Bulgaria for the period of 2007 - 2012, an interest in the STEM subjects can be seen as well as the fact that Bulgarian students pursue a degree in them (Figure 1) but they were also in the top 3 of the lowest achievers in science for this period (Figure 2). Concerns were raised in terms of the gender of the STEM graduates as well. There were 40% male and only 14% female students with STEM qualification.



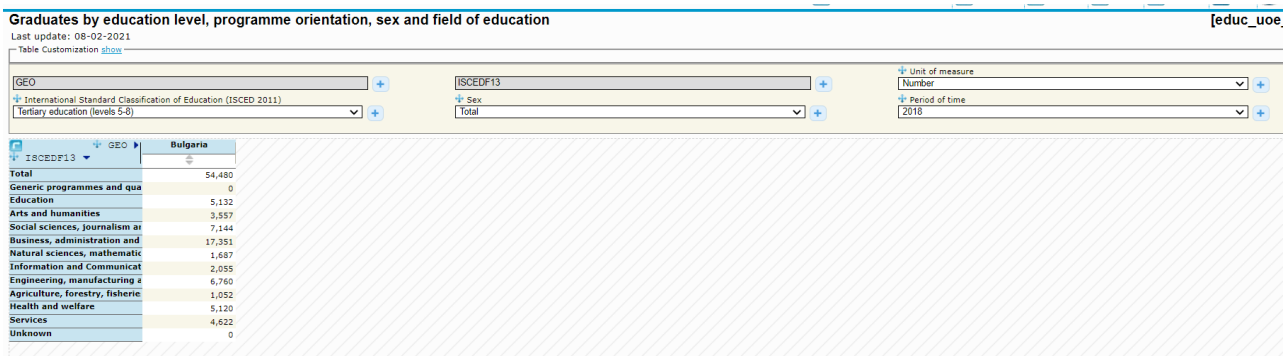


A forecast predicts a raise in the interest among employers in these subjects for the next 10 year (ending with year 2025). Many companies would pay great attention to candidates with additional knowledge in science and engineering, which stress even more their importance.
Still 4 years before the end of the described framework ends, and living in a fast-paced world, where every additional skill matters. The Coronavirus pandemic brought the need of scientists and technology experts in every country. Having this in mind, it is hard to conclude whether the forecast will still be applicable by the end of 2025.

Following the recent statistical reports from Eurostat on Bulgarian graduates in STEM subjects, regardless of their gender, the results are as follows (Table 1):

- There are a total of 54,480 graduates in 2018 (the most recent one), from which:
- 1,687 are in science and maths;
- 2.055 are in technologies;
- 6.760 in engineering.

Table 1: Eurostat statistics on Bulgarian graduates in STEM



Graduates by education level, programme orientation, sex and field of education [educ_uoe_

Last update: 08-02-2021

Table Customization show

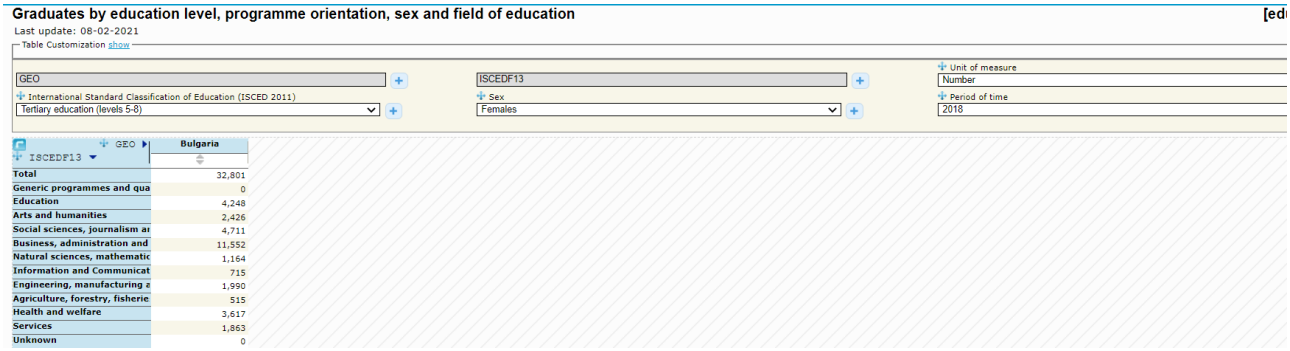
GEO | ISCEDF13 | Unit of measure: Number
International Standard Classification of Education (ISCED 2011): Tertiary education (levels 5-8) | Sex: Total | Period of time: 2018

ISCEDF13 \ GEO	Bulgaria
Total	54,480
Generic programmes and qua	0
Education	5,132
Arts and humanities	3,557
Social sciences, journalism ar	7,144
Business, administration and	17,351
Natural sciences, mathematic	1,687
Information and Communicat	2,055
Engineering, manufacturing a	6,760
Agriculture, forestry, fisherie	1,052
Health and welfare	5,120
Services	4,622
Unknown	0

To see whether the gender inequality is applicable for the Bulgarian students, a filter was intentionally added for the same period, but only for the female graduates (Table 2):

- From the total of 32,801 female graduates with STEM qualification,
- 1,164 are in science and maths;
- 715 in technologies;
- 1,990 in engineering.

Table 2: Eurostat statistics on female graduates in STEM



Graduates by education level, programme orientation, sex and field of education [ed

Last update: 08-02-2021

Table Customization show

GEO | ISCEDF13 | Unit of measure: Number
International Standard Classification of Education (ISCED 2011): Tertiary education (levels 5-8) | Sex: Females | Period of time: 2018

ISCEDF13 \ GEO	Bulgaria
Total	32,801
Generic programmes and qua	0
Education	4,248
Arts and humanities	2,426
Social sciences, journalism ar	4,711
Business, administration and	11,552
Natural sciences, mathematic	1,164
Information and Communicat	715
Engineering, manufacturing a	1,990
Agriculture, forestry, fisherie	515
Health and welfare	3,617
Services	1,863
Unknown	0

The results represent the following statistic:

1. As there are no indicators pointing to a specific number in graduates that should be qualified in STEM subjects, the report can not conclude whether the numbers are sufficient or not.
2. The STEM graduates in science and engineering are among the highest numbers from all additional qualification subjects. Therefore, the information satisfies the forecast mentioned above.

3. The female graduates are more than half of all STEM students. The gender inequality is no present in Bulgaria. Students' personal interest or the influencers of their decisions could be the potential reason behind the dispersion of numbers in all listed subjects, but no accurate information about it is available.

STEM trends, shortages, and the current situation in Bulgaria

According to the STEM shortages in Bulgaria, in a statistical report from 2011, it is said that the government needs to reform the whole education system (Cedefop, 2011). Because of the lack of interest from the youth, the mismatch in the demand from the labor market and the educational preparation from schools and universities, etc, whole sectors of the economy were endangered from extinction.
The situation nowadays can be seen in two ways. As seen in the previous chapter, there are a lot of students interested in the STEM subjects. In the Eurostat's regional yearbook for the previous year (2020) on the other hand, Bulgaria is ranked among the countries with higher rates in uneducated children at young age, school dropouts and longer levels of unemployment (Eurostat, 2020). As concluded from this statistic, Bulgaria is certainly not on of the top ranked countries in terms of education and employment, but inside the country, there are significant changes through the years. The table below (Table 3) represents the recent graduates that have got employed soon after they have graduated. The results for 2019 were the highest so far. Another more in-depth data about the employment rate of tertiary graduates in the EU for 2018 for Bulgaria showed 84,5% (Eurostat, 2019).

*Table 3:*Employment rates of recent graduates (Source: Eurostat, 2021)

Employment rates of recent graduates (online data code: TPS00053)
Source of data: Eurostat

Table | Line | Bar | Map

GEO / TIME	Bulgaria
2010	69.7 (b)
2011	59.2
2012	67.3
2013	67.7
2014	65.4 (b)
2015	74.6
2016	72.0
2017	77.7
2018	78.6
2019	80.7

The next two tables represent the employment rates in Bulgaria for 2020. The data has been collected from the Bulgarian National Statistics Institute (NSI, 2021). Because the STEM subjects are not officially separated from the other sectors of our economy, the underlined lines are the sectors of:

- Production and distribution of electricity and fuel energy and gas fuels,
- Constructions/ Engeneering,
- Financial and insurance activities,
- Professional and science activities.

These are the sectors where STEM students have the higher chances of getting involved in their chosen field. The statistical data shows high number of employments, which together with the above tables can evidence for the rates of employment among STEM graduates, along with pointing the economy sectors with highest rates of employment. According to other statistical reports, among the sectors with highest employment rates are the Technology and innovations one, the Healthcare and the Services sectors. This is another proof of the society's needs of educated STEM graduates.

Table 4: Employment rates in Bulgaria for 2020 (Source: NSI, 2020)

EMPLOYEES UNDER LABOUR CONTRACT BY ECONOMIC ACTIVITY GROUPINGS AND SECTORS IN 2020*

(Average annual number)

Economic activity	2020		
	Total	Public sector	Private sector
Total	**2 165 310**	**533 014**	**1 632 296**
Agriculture,forestry and fishing	66 720	11 034	55 686
Mining and quarrying	20 540	7 199	13 341
Manufacturing	465 340	6 217	459 123
Electricity,gas,steam and air conditioning supply	29 521	14 543	14 978
Water supply,sewerage,waste management and remediation activities	36 000	22 097	13 903
Construction	118 979	2 152	116 827
Wholesale and retail trade;repair of motor vehicles and motorcycles	372 205	337	371 868
Transportation and storage	134 481	46 357	88 124
Accommodation and food service activities	82 151	3 990	78 161
Information and communication	99 626	3 616	96 010
Financial and insurance activities	54 625	1 314	53 311
Real estate activities	20 116	2 480	17 636
Professional,scientific and technical activities	76 757	9 687	67 070
Administrative and support service activities	109 931	19 435	90 496
Public administration and defence;compulsory social security	112 484	112 484	x
Education	160 092	150 686	9 406
Human health and social work activities	141 615	104 084	37 531
Arts,entertainment and recreation	32 573	14 005	18 568
Other service activities	31 554	1 297	30 257

*Preliminary data

(Списъчен брой в края на месеца)

Месеци					
VII	VIII	IX	X	XI	XII
2 257 680	**2 255 721**	**2 249 110**	**2 249 905**	**2 245 328**	**2 228 280**
72 242	71 555	70 683	69 282	67 374	65 545
20 383	20 326	20 569	20 573	20 583	20 526
469 958	468 394	469 567	471 639	472 308	468 808
29 567	29 567	29 520	29 566	29 542	29 487
36 382	36 408	36 372	36 349	36 515	36 481
127 117	126 647	126 016	127 373	127 797	125 736
388 240	387 399	385 713	387 284	387 745	387 193
138 697	138 254	138 248	138 372	138 414	137 282
102 737	103 760	92 089	85 990	81 261	78 994
100 908	101 255	101 798	102 152	102 823	102 541
56 770	56 693	56 489	56 201	56 254	56 244
21 577	21 407	21 030	20 981	20 667	20 500
79 834	79 798	79 756	80 170	79 822	79 316
118 280	119 695	119 900	119 310	119 191	116 327
114 347	114 291	114 210	114 709	114 312	114 016
159 513	158 307	165 028	166 731	167 151	166 362
152 347	153 103	153 770	154 657	155 492	155 267
34 047	34 263	34 017	34 045	33 722	33 507
34 734	34 599	34 335	34 521	34 355	34 148

What should the Government do?

The Government should make progress in improving STEM education for all students in Bulgaria, working alongside with policy makers at the national, state, and local levels, NGOs and teachers should elevate science to the same level of importance as reading and mathematics. Science should be assessed with the same frequency as mathematics and literacy, using a system of assessment that supports learning and understanding. Such a system is not currently available in Bulgaria. Therefore, states and national organizations should develop effective systems of assessment that are aligned with the next generation of science standards and that emphasize science practices rather than mere factual recall.

National and state policy makers should invest in a coherent, focused, and sustained set of supports for STEM teachers to help them teach in effective ways. Teachers in STEM should have options to pursue professional learning that addresses their professional needs through a variety of mechanisms, including peer-to-peer collaboration, professional learning communities, and outreach with universities and other organizations.

What are the STEM sector trends?

As digitalisation spreads in all economic and social sectors, the digital skills are becoming more and more necessary. In fact, most jobs already require basic digital skills. This trend will increase in the future, and it can be argued that all participants in the labor market will need these skills to stay working. However, much of the workforce (employed, self-employed and unemployed) does not even have basic digital skills. There is a need to improve considerably the understanding and definition of the needs of digital skills, as well as to work actively to upgrade the digital skills of the workforce. It is a continuous process that requires people to acquire digital skills through a modern education system that provides the knowledge and skills needed for adaptation to the digital economy. A quality workforce is a product of a quality and effective lifelong education and training system, a system that is required to be related to the needs of the economy and employers.

The digitalization requires implementation of both preventive and follow-up measures to adapt the workforce. The prevention to enable new employment and transition from one employment to another with minimal or no period of unemployment, which can be implemented in the form of support for the acquisition of new knowledge and skills, individual approach to the vulnerable persons in the labor market and their need of skills and more high-quality career consulting and information services. It will also be important to provide reliable, up-to-date information on future trends in labor supply and demand. The follow-up measures will include training to acquire new or improve existing key competencies and professional qualifications and the acquisition of new skills for specific new jobs, as well as the full use of modern forms of learning and more opportunities for mobility.

Investment in further training and retraining should be fostered, particularly in the field of digital skills acquisition. Every effort should be made to reduce the differences in competencies between the different age groups in terms of information and communication technology skills, as well as the skills of the STEM group (science, technology, engineering and mathematics). It is of a paramount importance to identify the groups of people with the lowest digital and STEM skills and to take into account the need to include them in training in order to compensate for this deficit and improve their employability.

On the other hand, the demand for highly qualified specialists in the field of information and communication technologies is growing strongly, both for the needs of the rapidly developing ICT sector and for the needs of the economy, social sectors and public administration. To meet this challenge, a complete modernization of the education system at all levels is needed, and this is especially important for higher and secondary vocational education. It is necessary to timely update the training disciplines and add new courses, corresponding to the rapid development of ICT and the dynamic changes in the business organizations IT environment . The training of teachers, the availability of appropriate material base and the provision of better interaction of the educational structures with the business environment in ICT education are of a paramount

importance. The focus will be on expanding the career consulting and building an innovative learning environment to enable better career choices. This can be supported by setting quality standards for digital literacy training. Employers should be encouraged to provide non-formal digital on-the-job training, labor market intermediaries will be relied on to reduce structural qualification skills gaps, especially for workers at risk of losing their jobs due to automation, robotisation, and other similar work processes. The employment offices will foster inclusion in digital training and promote employers to hire trained workers.

What skills are most difficult to recruit for?

Hard skills are the specific abilities that can be measured and evaluated, based on the business needs. These skills are often essential for most STEM positions, and they are normally covered in the university curriculum or additional courses.
Soft skills are less tangible than hard skills and are more difficult to measure. Though they may not be as emphasized in job requirements, these skills are what help individuals make an impact and succeed in their position. The top four they identified are:

1. Leadership
2. Communication
3. Collaboration
4. Time Management

How STEM organizations are currently filling skill gaps?

Withing Bulgaria, there are many clubs and extracurricular courses for people or students interested in STEM subjects. In the recent years some corporate companies have started their academies for engineering and software development.
In additional there are yearly hackathons for people to code and resolve different business problems.

Conclusion

Regardless of the pandemic, there are still sufficient numbers of employees in the different sectors of the Bulgarian economy. Although many statistics show relatively low levels of education and interest among the youths in learning, the ones that choose to qualify and embrace the continuous path of learning and improving, have been given the chance to do so. Many organizations, schools and κniversities adopt the EU standard of education – both traditional and non-formal, to provide the students with the best innovative ways of teaching.
The overall results about the STEM graduates and their prospect chances of employment are neither low, no high, compared to the students outside the STEM fields. The data is insufficient for a detailed analysis on the lack of skills and the solution for the gaps to be provided, and further research should be conducted to satisfy these questions.

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