



© 2021 Medina. This article is distributed under the terms of CC Attribution-Share Alike 4.0 International as described at <https://creativecommons.org/licenses/by-sa/4.0>

DOI: 10.31499/2306-5532.1.2021.243101

UDC: 001-055.2:378.091(100)

WOMEN IN STEM: THE PICTURE OF UKRAINIAN UNIVERSITIES AGAINST THE WORLD BACKGROUND

Tetiana Medina

PhD in Sociology, Associate Professor,

Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine,

<https://orcid.org/0000-0003-2323-7513>, e-mail: t.medina@chnu.edu.ua

The article is devoted to analysing the processes of gender segregation in the scientific activity of the staff of Ukrainian universities. In Ukraine, as in all countries of the world, there is a gender imbalance among researchers, especially in STEM. A comparison of statistical information on the representation of women in the field of STEM-sciences, hosted by UNDP, UNESCO, World Economic Forum. It is determined that Ukraine's average position in the ranking of the Human Development Index is mainly due to equal access to education for men and women. Statistics provided by UNESCO show that the number of women in Ukraine engaged in research indicates a tendency towards gender parity. It has been suggested that higher representation of women in research in Eastern Europe is associated with lower pay for scientific work, resulting in the leaching of men from research. Here are some results of the project of the Ukrainian Association of Educational Researchers "When science is a woman: factors determining the scientific career of women in Poland and Ukraine" (implemented with the support of the University of Paris Dauphin) (France). The results of the online survey of STEM faculty members made it possible to find out that the most significant representation of women at the level of support staff is evidence of the existence of vertical gender segregation in the social structure of the university. There are fundamental differences in the career growth of women and men, and it has been suggested that the introduction of a gender culture centre will draw attention to such an essential issue in the functioning of Ukraine's scientific field.

Key words: *gender segregation, university, STEM, women in STEM*

Стаття присвячена аналізу процесів гендерної сегрегації в науковій діяльності співробітників українських університетів. В Україні, як і в усіх країнах світу, існує гендерний дисбаланс серед дослідників, особливо в галузі STEM. Проведено порівняння статистичної інформації щодо представництва жінок в галузі STEM-наук, розміщених UNDP, UNESCO, World Economic Forum. Визначено, що перебування України на середніх позиціях у рейтингу Індексу



людського розвитку зумовлено в основному рівними для чоловіків і жінок умовами доступу до освіти. За допомогою статистичної інформації, поширеної ЮНЕСКО, з'ясовано, що кількість жінок в Україні, зайнятих у сфері науково-дослідної діяльності, свідчить про тяжіння до гендерного паритету. Зроблено припущення, що більш високе представництво жінок в галузі наукових досліджень країн Східної Європи пов'язано з меншою оплатою наукової праці, внаслідок чого відбувається вимивання чоловіків зі сфери наукових досліджень. Наведено деякі результати проекту Української асоціації дослідників освіти «Коли наука – жінка: фактори, що визначають наукову кар'єру жінок у Польщі та Україні» (реалізовується за підтримки Паризького університету Дофіна (Франція). Статистичний аналіз кількості жінок і чоловіків на факультетах STEM-наук свідчить про помітне переважання чоловіків. Результати онлайн-анкетування викладачів STEM-факультетів дали можливість з'ясувати, що найбільша представленість жінок на рівні допоміжного персоналу. Це є свідченням існування в соціальній структурі університету явища вертикальної гендерної сегрегації. Відповіді викладачів свідчать про те, що не існує принципових відмінностей у посадовому зростанні жінок і чоловіків. Висловлено припущення, що запровадження центру гендерної культури дозволить привернути увагу до такого важливого питання функціонування наукової галузі України.

Ключові слова: гендерна сегрегація, університет, STEM, жінки в STEM науках.

Introduction. The issue of gender equality is a problem that worries most societies that strive to meet universal standards of civilization. Not surprisingly, a compulsory component of the Human Development Index is the Gender Development Index (GDI), which indicates the presence (absence) of gender inequality.

Like any other social organization, the university has specific features of its structure. However, as a rule, gender features of universities have signs of gender segregation -- unequal distribution of men and women in the fields of science (horizontal segregation) and access to management positions (vertical segregation). In many cases, horizontal gender segregation in scientific research is linked to permanent professional segregation and payment disproportions between men and women, primarily due to vertical segregation because of a lower number of women with scientific degrees (Medina, Plotnikov & Zagoruiko, 2021).

For centuries, social, cultural, and religious determinants have limited women's participation in science. It is especially true about STEM sciences, which show a significant predominance of men in most countries of the world. As a result, the advancement of women in this field is challenging, so it may be appropriate to assume that there is no gender equality at these faculties in the universities. Therefore, the given research aims to determine the characteristics of the gender structure of Ukrainian universities through a comparative analysis with global trends.

The analysis of gender statistics of women in various scientific fields shows the unequal distribution of women and men in European countries. The UNESCO Institute for Statistics (UIS) study contains the following information about the number



of female researchers: the Netherlands – 25,8%, France – 27,0%, Germany – 28,0%, Austria – 29,5%, Belgium – 34,1%, Italy – 35,2%, Poland – 36,4%, Norway – 37,6%, Great Britain – 38,7%, Slovakia – 41,4%, Estonia – 43,6%, Ukraine – 44,7%, Croatia – 47,7%, Bulgaria – 49,1%, Latvia – 52,2%, Northern Macedonia – 52,3% (UNESCO, 2019).

As we can see, in «Old Europe», gender disproportions among researchers are much stronger (towards a larger number of male scientists) than in Eastern and Southern Europe. However, if we consider the gender representation of scientists in STEM (Science, Technology, Engineering and Mathematics), the percentage of men will be much higher. In particular, «... in Europe, there are four times as many men researching computer technology science as women» (European Commission, 2018). In turn, in Ukraine, the number of women in technical sciences is 34,1% (State Statistics Service of Ukraine, 2018). That is why gender disbalance in STEM-related disciplines remains a problem that attracts the attention of scholars and politicians, and public figures.

The novelty of the topic was the reason for the authors of this research – members of the Ukrainian Association of Educational Researchers – to take part in the project “When science is a woman: factors determining women's scientific careers in Poland and Ukraine» (implemented with the support of Paris Dauphine University). It aims to conduct a comparative analysis of gender characteristics of STEM faculties and policies of two universities – in Poland (on the example of Adam Mickiewicz University) and Ukraine (on the example of Yuriy Fedkovych Chernivtsi National University). It will allow identifying the similarities and differences in women's careers in science and analyzing the gender characteristics of the scientific path. The project uses a combination of different sociological methods: quantitative (in an online survey of STEM faculty teachers), qualitative (in-depth interviews), statistical analysis of the number of women and men in STEM faculties. The result will be developing a gender strategy for both universities theses and recommendations for the wider academic community.

Methods. The results of a specific study are based on a comparison of statistics posted by UNDP, UNESCO, World Economic Forum. Also, the results of an online survey of teachers of STEM faculties of Chernivtsi National University, which was attended by 56 teachers (57), of whom 57% are men and 43% – women, will be given below. The author has experience in comparing different sociological methods for studying this scientific problem. The use of qualitative methods (in particular, the method of in-depth interviews) provides an opportunity to study the individual experience of a scientific career, to analyze its problematic aspects in terms of gender. However, they do not consider the impact of gender, which is a significant factor in forming specific behaviour patterns.

Results and discussion. The emergence of gender research as a field of scientific investigation has led to researchers' interest in the status of women in research activities. Since feminist and gender studies have been actively developed in the United States, the scientific achievements of American researchers are influential. It is worth mentioning Stephen Kulis' article “Gender Segregation among College and University Employees». It showed that the gender composition of employees of four-



year colleges and universities in the United States is more balanced when they have a relatively high number of female students and women administrators, less emphasis is paid to research, greater dependence on federal sources of revenue, as well as less funding (Kulis, 1997).

The article Ann L. Mullen, Jayne Baker (2018) contains information about the controversial situation related to the gender characteristics of the processes in higher education. The researchers have marked an increase in gender parity in access to a bachelor's degree (women make up 57%), but stagnant processes characterize horizontal gender segregation. Reducing the gender gap in university admissions did not have the expected effect of reducing the gender gap in professional segregation, partially because of the segregation of critical areas of learning. The authors propose a cultural-organizational approach that considers how institutional characteristics and cultural contexts on college campuses may influence gendered choices and thus be associated with patterns of gender segregation across fields of study.

The article Izaskun Zuazu (2018) «Gender Segregation by Field of Study in Higher Education: A New Way of Gender Inequality?» demonstrates that “more affluent and gender-egalitarian countries have also higher levels of gender segregation in HE, as it is generally found that more gender-egalitarian ideals might favour the divergence of preferences of women and men». It is suggested that women in countries with more gender inequality seek economic freedom by pursuing STEM fields because they are precisely conducive to higher-paid jobs in the labour market.

In Ukraine, despite the significant number of publications, there is a lack of empirical research on gender issues in general and in the scientific field in particular.

The problem mentioned in the title is thoroughly revealed in the article by N. Isakova (2018), who, based on the analysis of rich statistical material, concluded about the feminization of science in Ukraine, as well as the presence of evident gender segregation, according to which women are unevenly represented in different fields of science. The author notes that the study of the causes of gender segregation should be the subject of independent research.

The article by I. Bulkin (2017), who also used the statistical method to estimate the age structure of employees of scientific organizations, also attracts attention. The author concludes about the positive role of female researchers in reducing the bias towards older age groups in the natural, technical and social sciences, which arose as a result of many years of conservation of male staff potential.

Thus, the novelty of the problem attracts the attention of many scholars, but it is worth conducting a comparative study to clarify the problems relevant to the Ukrainian educational and scientific fields.

It is appropriate to begin the analysis with general points that indicate Ukraine's place in the world rankings on gender equality. In particular, the Human Development Report 2020 (UNDP, 2020) contains information on the Human Development Index, which includes gender equality. In this ranking, Ukraine takes the 74th out of 156 countries with an index of 0,714 (0 means no gender parity and 1 – gender equality) according to four indicators – economic participation and opportunities, education, health and survival level, political empowerment.



The same information is contained in the Global Gender Gap Report (World Economic Forum, 2021), presented annually at the World Economic Forum since 2006. This rating makes it possible to analyze the transformations in gender equality since the beginning of statistical data collection (See Table 1).

Table 1

**Global Gender Gap Index
(2021 compared to 2006, by place in the world rankings and average score)**

	2006		2021	
	place	average score	place	average score
Economic participation and opportunity	24	0,691	44	0,732
Educational attainment	25	0,998	27	1,000
Health and survival	1	0,980	41	0,978
Political empowerment	97	0,050	103	0,147
Global Gender Gap Index	48	0,680	74	0,714

Thus, Ukraine has moved from the 48th to 74th place in the world rankings over fifteen years, while its index has risen slightly. Other countries have significantly improved their rankings. An interesting indicator of gender equality in access to education refers to countries with a high level of gender equality. In turn, the indicator rejects Ukraine to countries with low gender parity – political rights and opportunities (World Economic Forum, 2021).

The study, conducted by the UNESCO Institute for Statistics, provides an opportunity to analyze the number of female researchers in different regions and countries engaged in scientific research activities. «The regional averages for the share of female researchers (based on available data only) for 2016 are:

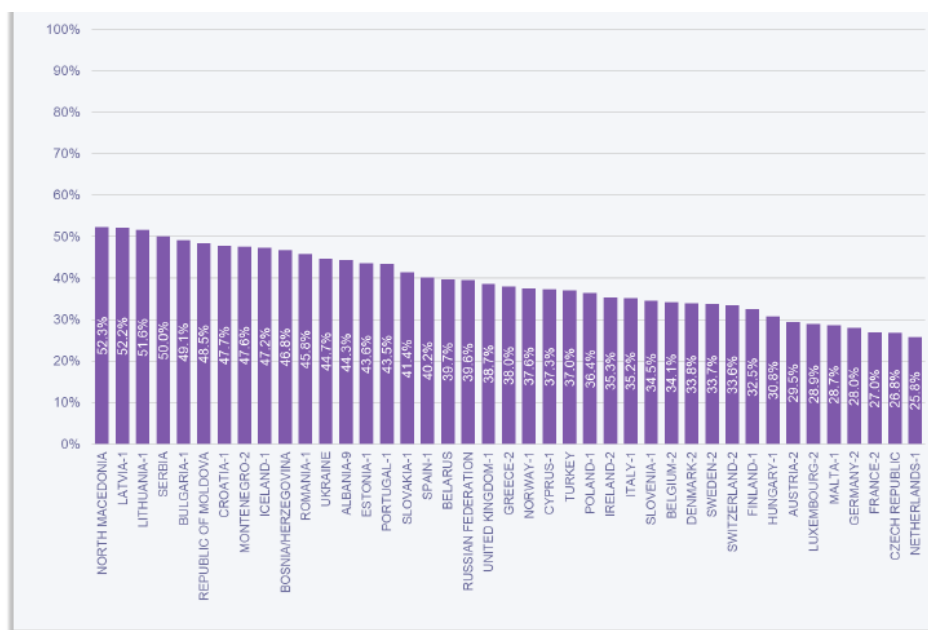
- 48,2% for Central Asia;
- 45,1% for Latin America and the Caribbean;
- 41,5% for Arab States;
- 39,3% for Central and Eastern Europe;
- 32,7% for North America and Western Europe;
- 31,8% for Sub-Saharan Africa;
- 23,9% for East Asia and the Pacific;
- 18,5% for South and West Asia;
- 29,3% for World (UNESCO, 2019).

Undoubtedly, such a situation is related to the cultural and religious peculiarities of the countries and women's access to education in general and opportunities to engage in scientific activities in particular. Countries dominated by Islam (primarily the Middle East) show the lowest representation of women in science.

Despite the high ratings of gender equality in European countries, the number of women in the scientific sphere of these countries is low and ranges from 25% (the Netherlands) to 52,3% (Northern Macedonia), and Ukraine is among the countries striving for gender balance (44,7%) (UNESCO, 2019).



As we can see from Figure 1 (UNESCO, 2019), the gender characteristics of the European scientific community indicate that the countries of Eastern Europe are characterized by a higher number of women in science. It can be assumed that the scientific field in these countries is less paid (compared to Western Europe), so it is less competitive with men. Ukraine's place in this ranking indicates a position above the European average.

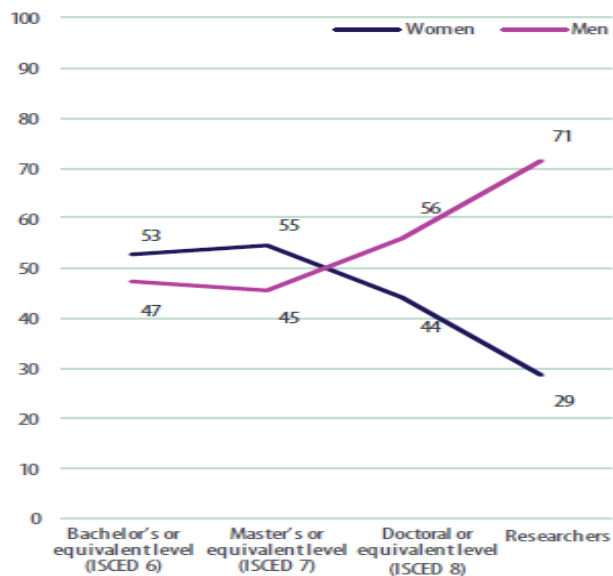


Notes: -1 = 2016, -2 = 2015, -9 = 2008.
Source: UNESCO Institute for Statistics, June 2019.

Figure 1. Participation of female researchers in Europe. Female researchers as a percentage of total researchers (HC), 2017 or latest year available

Thus, the above ratings indicate a multifactorial impact on the gender structure of the scientific field of a particular society. UNESCO is the organization that was one of the first to draw attention to the small number of women in STEM sciences. Despite significant progress in the number of women at all levels of education, there is a marked gender imbalance in these research areas. In particular, in STEM sciences, women make up less than 30% (UNESCO, 2017).

The process of vertical segregation is clearly shown in Figure 2, which represents a vivid process of reducing the number of women at each subsequent level of scientific career (UNESCO, 2017).



Source: UNESCO Institute for Statistics (UIS)

Figure 2. The proportion of women and men graduates in tertiary education by programme level and those employed as researchers, 2014

Despite the active process of feminization of Ukrainian science, identified by Ukrainian researchers (Bulkin, 2017; Isakova, 2018), gender disproportions in STEM are also vivid. Furthermore, the process of gender segregation in Ukrainian universities begins from obtaining a bachelor's degree.

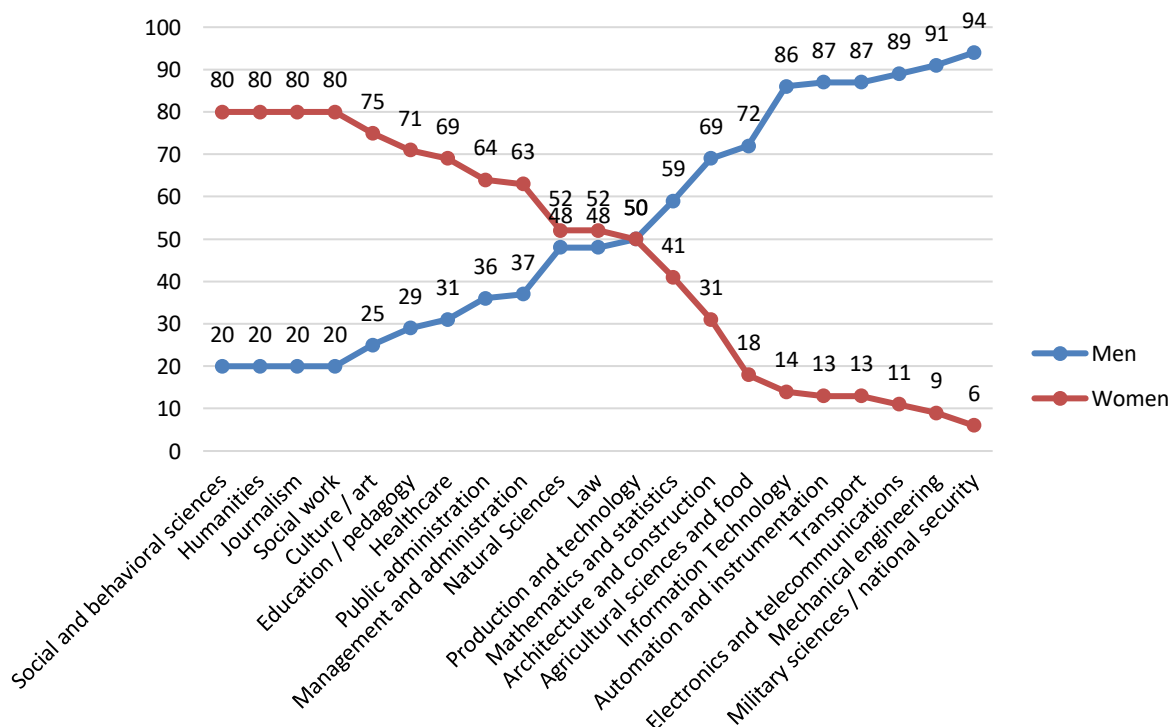


Figure 3. Distribution of students of universities, academies, institutes by fields of knowledge and educational degree "Bachelor at the beginning of 2019/2020 academic year», % (Oksamytna, 2020).



Figure 3 demonstrates a vivid division into female and male fields. A similar situation is inherent in the gender structure of the teaching staff of universities.

The results of an empirical study conducted at Yuriy Fedkovych Chernivtsi National University provide an opportunity to get a quantitative idea of the gender structure of a typical classical university and analyze the thoughts of STEM faculty staff about the presence/absence of gender segregation at different levels.

Quantitative analysis of the gender composition of university staff shows a significant predominance of men (See Table 2) at STEM faculties.

Table 2

Gender composition of teachers of STEM-faculties in 2020

	Candidates of Sciences (PhD)		Doctors of Sciences		Professors	
	f	m	f	m	f	m
Institute of Physical, Technical and Computer Sciences	27	75	4	28	3	22
Faculty of Mathematics and Informatics	21	18	2	14	0	11
Total	48	93	6	42	3	33

Even though there is a possibility of quantitative analysis of the men and women representation, the study participants were asked a particular question. According to the majority (65%), the university generally has about the same number of men and women, and 29% believe that men are more. If to analyze the categories of employees, then in some respects more men. It applies not only to the parameter "teachers/researchers" but also to the representation of men at the administration level. The most significant number of women is at the level of support staff, which indicates the existence of gender segregation in the social structure of the university.

According to 41% of respondents, representation in management positions is often given to men. However, there are twice as many women who support this statement as there are men. At the same time, more than half (53% of women and 60% of men) believe that there are no fundamental differences in the career growth of women and men.

As we can see, the participants of the study are not aware of the lack of equal opportunities for men and women, primarily in terms of scientific careers and career growth. It is evidence of a lack of awareness of gender culture issues. Therefore, creating a centre for gender culture and conducting research at the university level can be considered a perspective.

Thus, the Ukrainian scientific field tends to gender balance if we analyze the number of men and women. However, there is noticeable horizontal gender segregation due to «female» and «male» fields. Horizontal segregation is complemented by vertical. University staff reject most issues that can be assessed as discriminatory. An information campaign aimed at overcoming gender stereotypes in the university environment will help alleviate and gradually overcome the gender imbalance in STEM sciences.



Acknowledgements. The author is delighted to thank the University of Paris Dauphin (France) which supports the project “When science is a woman”.

References:

- Bulkyn, Y. (2017). Yzmeneniya v strukture yssledovatelei NAN Ukraynu: hendernui aspekt. [Changing in structure of researchers of NAS of Ukraine: gender aspect]. *Nauka ta naukoznavstvo*, 3, p. 46–64.
- European Commission, (2018). *More women in the digital sector: a key to Europe's successful digital future*. Retrieved from: <https://digital-strategy.ec.europa.eu/en/news/more-women-digital-sector-key-europes-successful-digital-future-international-womens-day-2018>
- Isakova, N. (2018). Hendernyi parytet u nauksi: tendentsii v sviti ta v Ukraini. [Gender parity in science: tendencies in the world and Ukraine]. *Nauka ta naukoznavstvo*, 2, 68–90.
- Kulis, S. (1997) Gender Segregation among College and University Employees. *Sociology of Education*. Vol. 70, No. 2 (Apr., 1997), pp. 151-173. Retrieved from: <https://www.jstor.org/stable/2673161>
- Medina, T., Plotnikov, Y, & Zagoruiko, L. (2021). Women academics in Ukrainian tertiary education: gendered image of occupational segregation. *Cadernos de Educação, Tecnologia e Sociedade* 14, 31-44. <https://doi.org/10.14571/brajets.v14.se1.2021.31-44>
- Mullen A., Baker, J. (2018) Gender Gaps in Undergraduate Fields of Study: Do College Characteristics Matter? *Socius: Sociological Research for a Dynamic World*. Volume 4: 1-14. Retrieved from <https://journals.sagepub.com/doi/full/10.1177/2378023118789566>
- Oksamytna, O. (2020) *Henderni vidminnosti u sferi zainiatosti, osvity ta navchannia v Ukraini v konteksti Uhody pro asotsiatsiiu*. [Gender differences in employment, education and training in Ukraine in the context of Agreement on association]. K.: HO «Ukrainskyi tsentr yevropeiskoi polityky.
- State Statistics Service of Ukraine, (2018). *Naukovi doslidzhennia i rozrobky u 2018 rotsi* [Scientific research and developments in 2018]. Retrieved from <http://www.ukrstat.gov.ua/>
- UNDP, (2020). Human Development Report 2020: The Next Frontier. Human Development and the Anthropocene. Retrieved from: <https://report.hdr.undp.org/>
- UNESCO, (2017). Cracking the code: girls and women’s education in STEM points out that ‘gender differences in STEM education participation at the expense of girls are already visible in early childhood care and education and become more visible at higher levels of education. Retrieved from: <https://euagenda.eu/upload/publications/untitled-137226-ea.pdf>.
- UNESCO, (2017). *Measuring Gender Equality in science and engineering: the saga toolkit*. Retrieved from: <http://uis.unesco.org/sites/default/files/documents/saga-toolkit-wp2-2017-en.pdf>
- UNESCO, (2019). *Women in Science*. Fact Sheet No. 55. Retrieved from: <http://uis.unesco.org/sites/default/files/documents/fs55-women-in-science-2019-en.pdf>
- World Economic Forum (2021). *Global Gender Gap Report*. Retrieved from: <https://www.weforum.org/reports/ab6795a1-960c-42b2-b3d5-587eccda6023>.
- Zuazu, I. (2018) *Gender Segregation by Field of Study in Higher Education: A New Way of Gender Inequality?* Wbg: Womens Budget Group. Retrieved from: <https://wbg.org.uk/blog/gender-segregation-by-field-of-study-in-higher-education-a-new-way-of-gender-inequality>.

Received: April, 27

Accepted: May, 29