

# SUSTAINABLE GENDER EQUITY INFLUENCED BY AN AMERICANIZED LEBANESE PEDAGOGY

Al-Abbas M\* and Oneissi J

*Lebanese American University, Lebanon*

**Abstract:** Gender representation and equity is a quintessential aspect of higher education, as research has shown higher level of research engagement between students and faculty of similar ethnicity, culture, or gender. Therefore, to promote increased student engagement and interest in pursuing graduate education across these groups, proper efforts and policies should be put in place to provide equitable and heterogenous representation. This study quantifies the importance of gender representation by employing a bibliometric analysis of female and male student engagement in research led by female or male faculty counterparts. The scope is the Lebanese American University and respective scholarly publications, due to its unique dichotomy of being an American-charted university, with American policies and international faculty, in a patriarchal Middle Eastern country. Our findings demonstrate that in 2020, 72.7% of publications with a female last author had a female first author, while only 52.4% of male last authors had a female first author. Whereas in 2021, the numbers decreased to 57.1% and 33.3%, respectively, likely due to COVID-19 prompting a decrease in published articles in female-led subjects. The elevated frequency of collaboration between first and last female authors illustrates increased engagement between students and faculty of the female gender, heightened by an effort to combat existing inequalities in representation. This is furthered by the comparable frequency of male and female student collaborations with male last authors, which could indicate some form of allyship to promote gender equity in research groups.

**Keywords:** gender equity, women in science, authorship, allyship, scholarly publication

## Introduction

By almost any metric, women have made great gains in closing the scientific gender gap. However, female researchers around the world continue to face major challenges (Shen, 2013). Female researchers are often undervalued, often receiving 80% of their male counterparts' salaries (West *et al.*, 2013), and underrepresented when it comes to hiring practices, promotions, publications in prestigious journals, and authorship positions (Conley & Stadmark, 2012; West *et al.*, 2013). Even as the number of female researchers engaged in scholastic pursuits continues to rise across all fields and disciplines, we continue to observe increasing instances of inequity (Bernardi *et al.*, 2020).

Gender inequity in academia is especially egregious, as previous studies have shown that gender inequity stifles scientific advancement while inclusive scholarly teams are more productive (Nielsen *et al.*, 2017; Sheltzer & Smith, 2014). Therefore, to better scientific advancement and engagement, inclusivity must be a cornerstone of team formation. Inclusivity must span the scientific gender gap through the promotion of leadership among female researchers. Leadership has many forms in the scientific community, ranging from assuming leadership positions in academia (deanship, chairmanship, etc.) to leading laboratories and research teams. In fact, the latter has often been

\*Corresponding Authors' Email: \*[Mohammad.alabbas@lau.edu](mailto:Mohammad.alabbas@lau.edu)

described as the stepping stone for any leadership position and a criterion of many faculty promotion/tenureship matrices (West *et al.*, 2013). Therefore, to truly measure the involvement, inclusivity, and leadership of female researchers, one must investigate their scholastic authorship.

However, gender inequity in the scientific community is not constant across countries and cultures. Studies have shown that different countries, cultures, and communities have varying levels of inequity based on gender productivity and career lengths which is often determined by a culture unique to each country (Huang *et al.*, 2020). Hence, when considering to investigate gender inequity, it is vital to consider the culture and location of the investigated data. In particular, some cultures are more patriarchal and would rather have women, in general, and researchers, in particular, serve different gendered roles that might often cut their careers short and keep them from assuming leadership roles (Huang *et al.*, 2020; Metcalfe, 2008; Morley, 2014).

This work aims to conduct an investigation into scholastic authorship of both genders in Lebanon, a country in the Middle East. Lebanon's culture is especially unique as it is conservative and patriarchal, but retains some liberal and feminist ideals; these ideals are exemplified by chartered universities in Lebanon that apply policies and provide relevant support systems, allowing them to become melting pots of culture. One such university is the Lebanese American University (LAU), where American gender policies (equal opportunity, anti-discrimination policies, etc.), as well as liberal and feminist ideals are imported and amalgamated with the local Lebanese culture. LAU is especially interesting as it is a Master's College with no Ph.D. programs and a relatively low number of master's degrees awarded annually. Therefore, student engagement is dependent primarily on undergraduates and a small graduate student body but allows the investigation of the mentor/mentee relationship across genders and several publications. Furthermore, LAU is considered a medium sized institution with little to no overlap between faculty specialties according to their Ph.D. theses. However, faculty specialties span a broad range of different disciplines under Social Sciences & Management, Engineering, Natural Sciences, Medicine & Life Sciences, and Arts & Humanities.

## **Methods**

### ***Gender and Author Leadership***

Scholarly leadership can be quantified through an investigation of author gender composition on published works. Traditionally, the first author contributes most and also receives most of the credit, whereas the position of subsequent authors is usually decided by contribution, alphabetical order, or reverse seniority (Tscharrntke *et al.*, 2007). However, as alphabetical order authorship is rarely ever adopted outside the disciplines of economics and high energy physics (Kosmulski, 2012), articles as such are considered negligible. Furthermore, whether by contribution or seniority, it is widely considered that the last author is the individual who conceived, supervised, and is the primary correspondence for the scholarly work, especially in scientific publications (West *et al.*, 2013; Wren *et al.*, 2007). Subsequently, this work focused on the gender of the first and last authors of published works. Both the first and last authors of published works had to be affiliated with the Lebanese American University to be considered.

### ***Labelling Gender***

To label and categorize the gender of the authors, a natural language processing (NLP) algorithm. The algorithm utilized a publicly available name-to-gender API named “genderize” [genderize.io], the API leverages a dataset of 114.5 million international names. However, given that our data is sourced from the Lebanese American University, located in Lebanon, we restricted the algorithm to the Lebanese names dataset as to avoid culturally specific names from being miscategorized. As an additional measure we queried, at random, several names and confirmed their gender based on social media (LinkedIn), faculty profiles, and Google Scholar. The authors would also like to acknowledge that while gender is a spectrum, recognizing genders beyond the female and male categorization, we adhered to traditional concepts of gender. Having done so allowed our results to be comparable to that of previous works.

### ***Dataset***

The dataset is exported from Clarivate's Incites database, narrowing the search to publications made by the Lebanese American University during the years of 2020 and 2021. Afterwards, the first and last author's affiliations are verified to correspond with that of LAU, if either author positions are not affiliated, that row is automatically deleted. After the verification, the datasets are exported to the “genderize” API where they are categorized as male or female. A full breakdown of the dataset can be found in appendix.

### **Results and Discussion**

InCite's database indexes 334 articles by LAU between 2020 and 2021. Once our methodology was applied to that database, we curated 84 articles that had first and last authors affiliated with LAU, with 43 published in 2020 and 41 published in 2021. In 2020, 72.7% of articles with a female last author had a female first author, while 52.4% of articles with a male last author had a female first author. Whereas in 2021, 57.1% of articles with a female last author had a female first author and only 33.3% of articles with a male last author had a female first author. The gender distribution of research teams is shown in Figure 1.

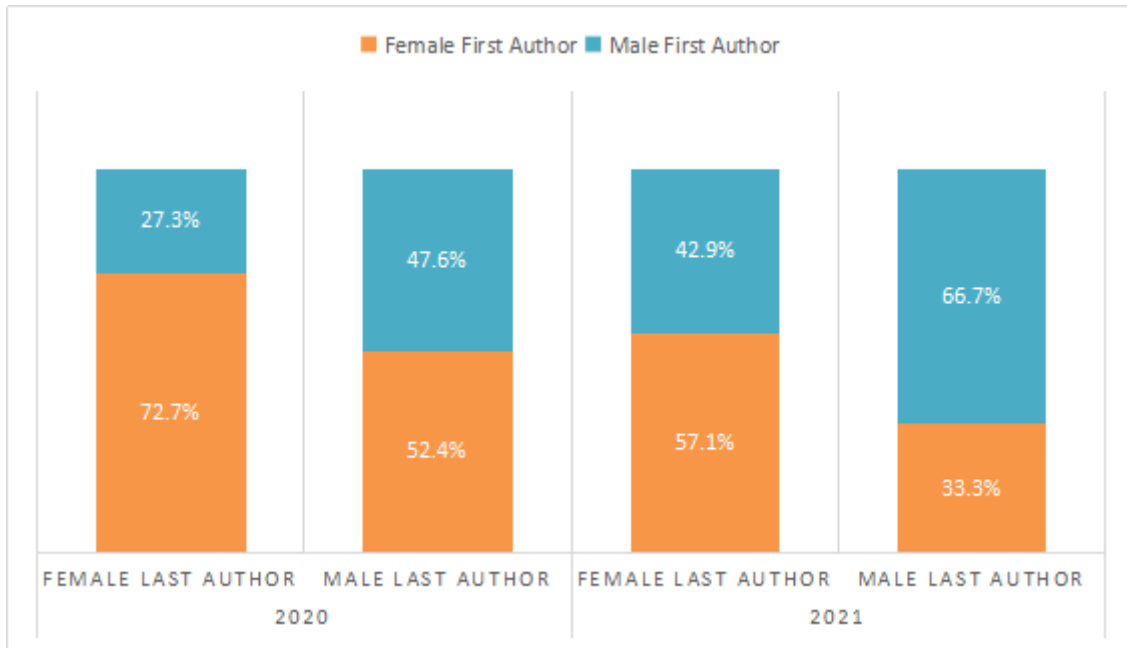


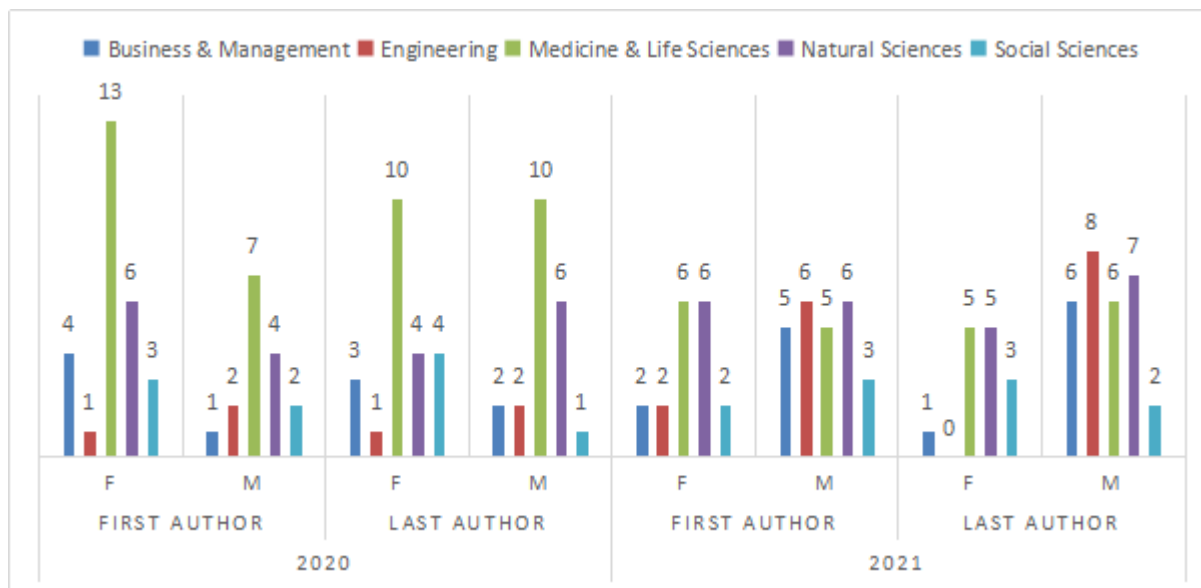
Figure 1: Distribution of first and last author teams' gender between the years of 2020 and 2021

This gender representation hints toward the decision-making process of each of the male and female last authors. The applied methodology allows us to curate articles where the first and last authors are affiliated with LAU, avoiding high multi-authored publications, which usually have international influence (Al-Abbas & Saab, 2020a, 2020b). These articles are often written by student first authors and faculty last authors, with only three instances of both authors being faculty. Therefore, we can draw a mentor and mentee relationship between the first author (mentee) and last author (mentor). As such, last authors engage with first authors with the aim of supporting and guiding them as well as leveraging their skills and capabilities.

Our results show that female last authors are likely favoring other females to mentor in an effort to facilitate their scholarly experience. Since they have themselves experienced the obstacles that come with being a woman in research (Nielsen *et al.*, 2017; West *et al.*, 2013), they are likely attempting to alleviate the struggles of qualified female researchers by working with them on articles and amplifying their portfolio. This decision could be taken as an initiative by individual female researchers in order to combat the existing inequalities women experience in research. On the other hand, male last authors could be acting as allies, having recognized their role and responsibility in eliminating such inequalities by supporting female and male researchers fairly. This incorporation of female researchers under the mentorship of male researchers, as well as their counterparts, provide for heterogeneous research groups, which are found to achieve higher scholastic productivity and engagement, making way for greater scientific advancements.

In order to understand the shift in gender distribution during 2021, we must first dissect the scholarly works by subject. Leveraging the All-Science-Journal-Classification (ASJC), we are able to divide journals into disciplines and fields. Then, we grouped the journals based on five broad subject categories: (1) Business and management, (2) Engineering, (3) Medicine & life sciences, (4) Natural sciences, and (5) Social sciences. The division allows us to visualize the gender distribution, whether

first or last author, across the varying disciplines to investigate if genders are equitably represented in all disciplines. The distribution is shown in Figure 2.



*Figure 2: Gender distribution of first and last author in all five broad subject categories across 2020 and 2021.*

The data indicates a 36.4% and 33.3% decrease, between 2020 and 2021, in female last and first author engagement, respectively. Furthermore, this decrease could be attributed to a decrease in the number of engaged authors in Medicine & life science, a subject that is dominated by female authorship in both years but has a severely decreased volume of publication in 2021 compared to 2020. The likely justification behind the decreased productivity of that field as opposed to increased productivity in others is the COVID-19 lockdowns that restricted access to labs, reagents, and materials that are pivotal to conducting research in the field of life sciences. In light of this, setting aside the influence of the COVID-19 lockdown on research output, these distributions reveal the unique environment established in LAU, born out of the Lebanese culture and American policies.

Education in Lebanon is held at a high regard for both women and men, which is why the enrollment of women and men in education is almost equal, with women even forming the majority at some levels (Bacha & Bahous, 2013; USAID, 2019). Women are encouraged to pursue their education although the reason for this support could be vested in patriarchal assumptions, such as the prospect of finding a husband while at university. Thus, it is apparent that while women do attend tertiary education at the same rate as men, the support they receive does not extend to engaging in research or launching a career in academia and is rather restricted only to the goal of getting a degree. The patriarchal and misogynistic aspects of the Lebanese culture and society still constitute a setback preventing women from achieving equitable representation and involvement in academia or research, where they are not provided the same opportunities as men due to social and economic constraints.

However, the policies set in LAU as an American-chartered university have helped counter that while leveraging the Lebanese gendered support for enrollment in education. One such policy is Title IX, a 1972 education amendment to the American Civil Rights law that prohibits discrimination on the basis of sex in any federally funded education program or activity and seeks to ensure gender equality in education (Stratcom, 2019). Title IX goes beyond protecting individuals from discrimination and harassment to also target systemic and structural issues of inequality. Some of the activities led by this

office include advocating for equity and inclusion throughout the university, its projects, and activities, training students, faculty, and staff on rights and responsibilities toward gender equity and inclusion, and receiving complaints regarding instances of discrimination or harassment in order to hold perpetrators accountable. As a result, this office not only helps create an environment that women can feel safe in, but also enables women to push forward beyond simply attaining a degree in order to be more involved in academic research and scholarly work.

## Conclusion

This work has assessed gender equity within a higher education institution located in a patriarchal society and influenced by American policies and feminist ideals. We found that female faculty in LAU often display comradery and mentor female students at a much higher rate than their male counterparts. In turn, the male faculty members have demonstrated allyship towards female students as well. However, this phenomenon seems to be tethered to the productivity of fields, as a decrease in medicine & life sciences publications in 2021 yielded a decrease of engagement by females in research overall. Therefore, work is still needed to promote inclusivity and engagement beyond the bounds of departments and disciplines. Looking at engineering, where in 2021 no publications had a female last author, this likely, in turn, affected the amount of female first authors engaged in engineering research. We also acknowledge the effect a title IX office had in ensuring that healthy and non-exploitative mentor-mentee relationships are feasible and sustainable.

## Declaration of Interest Statement

The authors declare that they have no conflict of interests.

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## Appendix

Article	Last Author Gender	First Author Gender	General Subject Area	Year
(Maalouf et al., 2020)	F	F	Business & Management	2020
(Mrad et al., 2020)	F	F	Business & Management	2020
(Assaker et al., 2020)	F	M	Business & Management	2020
(M. F. Farah & Ramadan, 2020)	M	F	Business & Management	2020
(M. F. Farah & Shahzad, 2020)	M	F	Business & Management	2020
(Antar & Elkhoury, 2020)	F	M	Engineering	2020
(Mehanna et al., 2020)	M	F	Engineering	2020
(Sami & Mourad, 2020)	M	M	Engineering	2020
(Makke et al., 2020)	F	F	Medicine & life Sciences	2020
(Moussa et al., 2020)	F	F	Medicine & life Sciences	2020
(Salloum, Moussa, et al., 2020)	F	F	Medicine & life Sciences	2020
(Salloum, Panossian, et al., 2020)	F	F	Medicine & life Sciences	2020
(M. El Khoury et al., 2020)	F	F	Medicine & life Sciences	2020
(Sayyed et al., 2020)	F	F	Medicine & life Sciences	2020
(Doumit et al., 2020)	F	F	Medicine & life Sciences	2020
(Bilen et al., 2020)	F	F	Medicine & life Sciences	2020
(Khalifeh et al., 2020)	F	M	Medicine & life Sciences	2020
(Hodroj et al., 2020)	F	M	Medicine & life Sciences	2020
(Dagher-Hamalian et al., 2020)	M	F	Medicine & life Sciences	2020
(Nasreddine et al., 2020)	M	F	Medicine & life Sciences	2020
(Abi-Gerges et al., 2020)	M	F	Medicine & life Sciences	2020
(El Hajj et al., 2020)	M	F	Medicine & life Sciences	2020
(Diab et al., 2020)	M	F	Medicine & life Sciences	2020
(Ahdab et al., 2019)	M	M	Medicine & life Sciences	2020
(Yammine & Assi, 2020)	M	M	Medicine & life Sciences	2020
(Assi et al., 2020)	M	M	Medicine & life Sciences	2020
(Assi et al., 2021)	M	M	Medicine & life Sciences	2020
(Shebaby et al., 2020)	M	M	Medicine & life Sciences	2020
(Al Haddad et al., 2020)	F	F	Natural Sciences	2020
(Idriss et al., 2020)	F	F	Natural Sciences	2020
(Sweidan et al., 2020)	F	F	Natural Sciences	2020
(E. Issa et al., 2020)	F	M	Natural Sciences	2020
(Elaridi et al., 2020)	M	F	Natural Sciences	2020
(Al-Alam et al., 2020)	M	F	Natural Sciences	2020
(Tohme et al., 2020)	M	F	Natural Sciences	2020
(Tay & Mourad, 2020)	M	M	Natural Sciences	2020
(Khalife et al., 2020)	M	M	Natural Sciences	2020
(J. S. Issa & Habchi, 2020)	M	M	Natural Sciences	2020

<b>(Fakhoury, 2021)</b>	F	F	Social Sciences	2020
<b>(Sarouphim &amp; Kassem, 2020)</b>	F	F	Social Sciences	2020
<b>(Bouclaous et al., 2021)</b>	F	F	Social Sciences	2020
<b>(Melki &amp; Hitti, 2021)</b>	F	M	Social Sciences	2020
<b>(Al-Abbas et al., 2020)</b>	M	M	Social Sciences	2020
<b>(Tarhini et al., 2021)</b>	F	M	Business & Management	2021
<b>(Dabbous &amp; Tarhini, 2021)</b>	M	F	Business & Management	2021
<b>(Antounian et al., 2021)</b>	M	F	Business & Management	2021
<b>(Al-Abbas &amp; Saab, 2021)</b>	M	M	Business & Management	2021
<b>(Bouri, Saeed, et al., 2021)</b>	M	M	Business & Management	2021
<b>(Bouri, Lucey, et al., 2021)</b>	M	M	Business & Management	2021
<b>(Aoun Barakat et al., 2021)</b>	M	F	Engineering	2021
<b>(El-Rajab &amp; Abou-Rjeily, 2021)</b>	M	F	Engineering	2021
<b>(N. Farah &amp; Ghadboun, 2021)</b>	M	M	Engineering	2021
<b>(Wahab et al., 2021)</b>	M	M	Engineering	2021
<b>(Mourad et al., 2021)</b>	M	M	Engineering	2021
<b>(Assaad et al., 2021)</b>	M	M	Engineering	2021
<b>(Said Saab et al., 2021)</b>	M	M	Engineering	2021
<b>(Tannous et al., 2021)</b>	M	M	Engineering	2021
<b>(El-Mais et al., 2021)</b>	F	F	Medicine & life Sciences	2021
<b>(Berro et al., 2021)</b>	F	F	Medicine & life Sciences	2021
<b>(Feghali et al., 2021)</b>	F	F	Medicine & life Sciences	2021
<b>(Saliba et al., 2021)</b>	F	M	Medicine & life Sciences	2021
<b>(Di Lernia &amp; Ricci, 2015)</b>	F	M	Medicine & life Sciences	2021
<b>(Harhous et al., 2021)</b>	M	F	Medicine & life Sciences	2021
<b>(Karaoui et al., 2021)</b>	M	F	Medicine & life Sciences	2021
<b>(Mansour et al., 2021)</b>	M	F	Medicine & life Sciences	2021
<b>(Wakim et al., 2021)</b>	M	M	Medicine & life Sciences	2021
<b>(Jardaly &amp; Gilbert, 2021)</b>	M	M	Medicine & life Sciences	2021
<b>(Shebaby et al., 2021)</b>	M	M	Medicine & life Sciences	2021
<b>(Hanna et al., 2021)</b>	F	F	Natural Sciences	2021
<b>(Jaafar et al., 2021)</b>	F	F	Natural Sciences	2021
<b>(EL-CHAMI et al., 2021)</b>	F	F	Natural Sciences	2021
<b>(Itani &amp; Chaker, 2021)</b>	F	M	Natural Sciences	2021
<b>(Chmaisani &amp; Elmoussaoui, 2021)</b>	F	M	Natural Sciences	2021
<b>(Elaridi et al., 2021)</b>	M	F	Natural Sciences	2021
<b>(Nader et al., 2021)</b>	M	F	Natural Sciences	2021
<b>(C. Al Khoury, 2021)</b>	M	M	Natural Sciences	2021
<b>(Bouri, Gupta, et al., 2021)</b>	M	M	Natural Sciences	2021
<b>(Khalil et al., 2021)</b>	M	M	Natural Sciences	2021
<b>(Eslami et al., 2021)</b>	M	M	Natural Sciences	2021

<b>(Sanchez-Ruiz et al., 2021)</b>	F	F	Social Sciences	2021
<b>(Djoundourian, 2021)</b>	F	F	Social Sciences	2021
<b>(Dibeh et al., 2021)</b>	F	M	Social Sciences	2021
<b>(Yacoubian, 2021)</b>	M	M	Social Sciences	2021
<b>(O'Connor &amp; Assaker, 2021)</b>	M	M	Social Sciences	2021