Using Social Media and Network Services to Promote Statistical Collaboration Laboratories: A Case Study of LEA Brazil

Marcus Alexandre Nunes, Carla Almeida Vivacqua, Talita Viviane Siqueira de Barros, Andressa Nunes Siroky, and Eliardo Guimarães da Costa

1 Introduction

Statistical consulting is as old as the discipline of Probability and Statistics. For example, French mathematicians assisted the Chevalier de Méré with gaming, the problem of points, which led to the development of the theory of probability, the core of the concept of risk. Their solution meant that people could for the first time make decisions and forecast the future with the help of numbers (Bernstein, 1996). Also, much of the pioneering work of Fisher, which set the foundations for statistical science, arose from the need to assist researchers to analyze their data. Nevertheless, statistical consulting received little coverage in the literature (Russell, 2001).

Statistics is particularly useful for decision-making in many fields (see, for example, Geller (2011) and Allen et al. (2016)). In addition to the theoretical and methodological context, Statistics professionals also need experience in communicating with different professionals, as Vance (2015a) indicated. Russell (2001) lists some attributes that a competent consultant statistician must have, for example, (1) interpersonal skills: the ability of the statistician to be able to communicate with researchers from other fields; (2) technical skills: technical aspects of Probability and Statistics, as well as computational tools; (3) self-management skills: the ability to manage the required time to the consulting and related tasks; and (4) business management skills: to justify the time and money spent on activities related to the consulting. For many universities in Brazil, teaching these attributes to undergraduate students in Statistics is a real challenge. In the context of graduate programs, the students of the Department of Biostatistics at the University of North Carolina at Chapel Hill are an example of those who are required to enroll in two

M. A. Nunes (✉) · C. A. Vivacqua · T. V. S. de Barros · A. N. Siroky · E. G. da Costa
Federal University of Rio Grande do Norte (UFRN), Natal, Brazil
e-mail: marcus.nunes@ufrn.br

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

O. O. Awe, E. A. Vance (eds.), *Sustainable Statistical and Data Science Methods and Practices*, STEAM-H: Science, Technology, Engineering, Agriculture, Mathematics & Health, https://doi.org/10.1007/978-3-031-41352-0_1

courses to develop statistical consulting skills. The second course takes place under the supervision of a faculty member and the student may interact with researchers from other fields (Bangdiwala et al., 2002).

According to Marek et al. (2004), one approach to training statisticians is to involve them in all aspects of the process, from designing objectives to data collection, analysis, interpretation, and presentation of results. In this sense, statistical laboratories represent an effective alternative to improve the acquisition of knowledge and skills.

Taking this into account, the Laboratory for Interdisciplinary Statistical Analysis (LISA) launched the LISA 2020 project as one of the activities for the International Year of Statistics in 2013 (Vance et al., 2022). The project's mission is to train statisticians from developing countries, enabling them to become statistical collaborators and solve real problems. One of the objectives behind LISA 2020 is to focus on collaboration over consultation. Furthermore, the project intended to build a network of at least 20 statistical collaboration laboratories by October 2020, as indicated by Awe and Vance (2014).

According to Vance (2015b), each statistical laboratory has three missions:

1. Train statisticians and data scientists to become effective, interdisciplinary collaborators who can move between theory and practice to solve real-world impact problems;
2. Serve as a research infrastructure for researchers and decision-makers to collaborate with statisticians and data scientists to enable and accelerate data-driven research and decisions that have a positive impact on society;
3. Teach short courses and workshops to broadly improve statistical skills.

To achieve the goal of creating a robust network of 20 statistical laboratories in developing countries by October 2020, Dr. Vance, creator and mentor of LISA 2020, and his team carry out the following activities:

1. Identify and train statisticians and data scientists from developing countries to become effective, interdisciplinary collaborators, then support them to create statistical laboratories at their home institution;
2. Identify and train LISA Ambassadors and LISA Mentors to help directors build their stats labs, gain support from their institutions, and make stats labs sustainable;
3. Build a support network to enhance skills and share best practices through LISA 2020 Symposia, bi-annual online network meetings, exchanges, and a mentor network of technical experts to assist projects as needed;
4. Comprehensively assess long-term sustainability and implement plans to achieve it;
5. Scale these efforts to produce many more skilled statisticians and data scientists who innovate local solutions to local challenges and collaborate across the world to solve global problems.

In October 2020, 28 laboratories of this type were part of the network, three of them in Brazil (LISA, 2020). Moreover, there are 35 full labs and 13 transitional or proposed labs on the network as of 2022 (Vance et al., 2022).

2 Statistical Collaboration at UFRN

Knowing about the LISA 2020 project, the Federal University of Rio Grande do Norte (UFRN), through the Laboratory of Applied Statistics (LEA), took the initiative to become a partner of LISA in 2015. Our lab was the fifth to join the network and the first outside the African continent. This partnership provides an opportunity to exchange best practices and discuss strategies to overcome challenging problems faced by statistical laboratories. Members work in interdisciplinary teams and have the opportunity to interact with students, professors, and professionals from different fields to collaborate in advancing research and solving business and social problems. They are also encouraged to write reports and present the results of their collaborations at seminars and conferences.

In addition, members can experience the process of preparing, presenting, and publishing scientific works. Since 2015, four presentations have been published at international conferences (in Morocco, Japan, Malaysia, and Ghana) and one book chapter was written by the laboratory team (Nunes, 2022). These numbers only consider the articles related to experiences and methodologies for teaching statistical consulting, *i.e.*, these publications do not consider derivative works that emerged from a collaboration with researchers from other fields.

LEA is a team of faculty, staff, and undergraduate students in the Department of Statistics at the Federal University of Rio Grande do Norte (UFRN). Currently, UFRN has more than 43,000 students (undergraduates and graduates) and about 5500 civil servants between academic and administrative staff (UFRN, 2022). The lab mostly provides statistical support to UFRN students and researchers interested in short-term collaborations. We are located in Natal, a coastal city in the northeast of Brazil, with a total population of 896,708 people in 2021, according to the estimate of the Brazilian Institute of Geography and Statistics (IBGE, 2021). The laboratory was created in 1978 and, since its reformulation in 2012, it has been serving the research community in our university, with occasional collaborations with other universities and companies. Currently, there are eleven professors and one statistician advising the enrolled students.

Until 2020, the enrollment of undergraduate students in the laboratory was mandatory for at least two semesters as a condition for graduating as a statistician. Since 2021, and inspired by the guidelines proposed in Vivacqua et al. (2018), the statistical consulting activities have been included in the Bachelor of Science in Statistics curriculum as courses, with attributed grades and weekly meetings. There are six courses, namely:

Statistical Consulting I – Communication
Statistical Consulting II – Exploratory Data Analysis
Statistical Consulting III – Junior Consulting
Statistical Consulting IV – Junior Consulting
Statistical Consulting V – Senior Consulting
Statistical Consulting VI – Senior Consulting

The undergraduate students start to work on collaboration projects as soon as they reach their third semester. One of the reasons for this change was the low student retention in the bachelor's we offer. Talking to older students, we noticed that they considered their courses very theoretical, failing to see real-world applications of the course's content. Hence, even with limited statistical experience, we offer a first contact with real data projects to our students in their third semester, to keep them engaged with their formation.

In this first contact, the students learn about the importance of communication in a collaboration project. It is a semester-long course where the students learn that every statistical collaboration project begins with a kick-off meeting between the student consultants and the collaborator. During this meeting, consultants will discuss the collaborator's needs, objectives, and goals of their project. The consultant can also review existing data sources or suggest new ones. Also, in the course the students learn what is and how to apply the POWER Method, defined by Zahn et al. (2013). Each meeting held by project members follows its guidelines, which involve segmenting meetings into five stages, summarized in the acronym POWER:

1. Prepare
2. Open
3. Work
4. End
5. Reflect

In this way, consultants can interview collaborators to gather as much information as possible about the work they are proposing to develop. We view this work as an academic collaboration in which each party will be able to expand their academic and professional skills. In their first course, the students are required to follow a collaboration meeting with more experienced students and understand the problem the client has. They are not required to apply any statistical method yet.

Each course on the consulting track has its own set of activities for the students. For Statistical Consulting II – Exploratory Data Analysis, the students have to be in the collaboration meeting and make the tables and plots for the report that will be handed to the client. They still do not need to apply any statistical method.

In their fifth semester in the Bachelor's and third semester on the consulting track, the students are enrolled in Statistical Consulting III – Junior Consulting. They still need to go to meetings with the collaborators, but this time they will be responsible for the data analysis. After the client's problem is understood, they will discuss what are the next steps with an advisor. In general, simple inference

or sampling techniques are used by these students. The same is valid for Statistical Consulting IV – Junior Consulting.

Statistical Consulting V and VI are both named Senior Consulting. They are very similar to Statistical Consulting III and IV, except that the students can apply more advanced statistical methods. Complex sampling, multivariate analyses, and dashboard designs are common tasks at these levels.

Notice that the students do not work alone on these statistical collaboration projects. Each project has a team assigned to it. Usually, there are two or more students and one professor. The students have different seniorities, so each one is responsible for a part of the collaboration. For example, a team can be made up of two students, one from Statistical Consulting II – Exploratory Data Analysis and one from Statistical Consulting VI – Senior Consulting. In this case, one student will make plots and tables, while the other will carry out the data analysis. While both will be advised by a professor, very often the less experienced student is also trained by the most experienced, making this arrangement a win-win situation. The less experienced student can have a mentor and role model closer to their age, while the more experienced have the opportunity to explain what they did in the analysis, making it easier and more natural to report the results to the client later, after the report is done.

Every semester LEA publishes an announcement in the university newsletter with the application instructions for those who want to request statistical advice. Our most frequent collaborators are students and professors from health and human sciences. There are approximately 15 Statistics undergraduate students working in the laboratory each semester, but this number fluctuates according to student availability.

In March 2020, classroom teaching activities were suspended due to the COVID-19 pandemic. In the second semester of 2020, the university established remote teaching activities and the laboratory restarted its activities and its collaboration meetings remotely. In early 2022, offline classroom teaching activities resumed and the laboratory returned to face-to-face consulting meetings in March 2022. However, once online meetings have become more widespread, with multiple programs and application options, it was decided to add this option to run statistical collaborations, *i.e.*, LEA continued to offer statistical advice also for people from other regions of the country.

One of the biggest difficulties that our laboratory faced in the second semester of 2020 and both semesters of 2021 was related to the number of collaboration requests we received. It is not clear if this happened due to the pandemic, fewer research funds or some other reason, but the demand for our services decreased during this period. Hence, we needed some way to get us back to being sought after by our target audience so that we had enough collaboration requests for all students.

Social media and network services are widespread tools that have become one of the defining technologies of our time and for most people the primary domain in which they receive information (Appel et al., 2020). In Brazil, we observed

an increase in the number of Departments of Statistics creating social media and network accounts to advertise their events, meetings, conferences, etc. Therefore, using the Internet to advertise our collaboration work was a natural choice. In this way, we decided to use this approach in the hope that the number of collaboration requests would expand. Since the use of social media and network services can be done for free, we chose it because, like many labs in developing countries, LEA does not have a marketing budget. We understand that using social networks is similar to the university newsletter and word-of-mouth advertising that we were using so far.

3 Methods

To advertise our laboratory services, the following social media and network services were used: Instagram, Facebook, WhatsApp, and the UFRN email system. The subjects in the study were all followers of the Instagram accounts of the Department of Statistics and the College of Exact and Earth Sciences at UFRN. We also used a Facebook group for graduate students at the national level in Brazil and some personal contacts on WhatsApp to publicize our services. Stadtfeld et al. (2019) show, with a cohort of 226 university students, that students create and advance social networks through time. Hence, it was the natural choice to use the available social media and network profiles to try to reach a wider audience that needed statistical advice.

We designed and ran the experiment ourselves. The advertising material that was used was also created by ourselves. One of the flyers used (translated to English, since the originals were made in Portuguese) may be seen in Fig. 1. These flyers were shared on the Instagram profiles of our Department of Statistics and College of Exact and Earth Sciences. Also, a post in the graduate students' Facebook group was created with the announcement information and a link to the LEA website. The same information was also sent privately on WhatsApp to professors' personal contacts to create an online word-of-mouth advertisement. According to Zander et al. (2018), the use of social networks is related to academic support networks, suggesting that the use of social networks could improve the real-life support of our lab in our academic community.

This first experiment ran for 1 month, from December 14th, 2021 until January 14th, 2022. The success of this campaign was measured by comparing the number of statistical collaboration requests received after the experiment was run with the average number of collaboration requests received in the previous semesters.

A second experiment ran from July 21st to July 28th, 2022. The following advertising message was sent to the university community by the UFRN email system:

> The Laboratory of Applied Statistics (LEA) of the Department of Statistics (DEST), linked to the Center for Exact and Earth Sciences (CCET/UFRN), selects new projects to receive guidance and statistical assistance in the 2022.2 semester. The approved works will receive

Fig. 1 English translation of the banner used to advertise our lab services on social networks

free follow-up from the LEA in the form of collaborations carried out by a team of students and advisors. Applications have been extended until July 28.

The public notice and registration form can be found on the Laboratory website http://lea.estatistica.ccet.ufrn.br/.

To register, simply fill in the registration form and send it to the laboratory's email: lea.ccet.ufrn@gmail.com.

Yours sincerely,

LEA team.

This system allows communication between all UFRN members, professors, administrative staff, and students. This experiment's success was measured in the same way as the previous experiment.

4 Results

On average, we had 6.33 statistical collaboration requests during the three semesters that started during the COVID-19 pandemic. These semesters were 2020.2 (spring semester), 2021.1 (fall semester), and 2021.2 (spring semester).

During these three semesters, we had problems finding enough projects for our students to work with. After our first experiment was run and we advertised our laboratory on Instagram, Facebook, and WhatsApp, we received several requests equal to the number of students enrolled in the laboratory. In total, we received 12 statistical collaboration requests, a 90% increase in the past three semesters' average. And after the second experiment, we received a total of 49 collaboration requests, almost 6 times more requests than the average of the three previous semesters. The results can be seen in Fig. 2.

When compared to the average number of statistical collaboration requests received during the pandemic and before the first experiment (6.33), the number of collaboration requests received by the lab for the semester 2022.1 (12) is 90% higher. Hence, we believe that this experiment made the lab more sustainable since the number of requests has increased by a large factor. These results suggest that our services are needed and desired in our university.

In Fig. 2, it is also possible to observe that there is a decreasing trend since 2017. However, one can see that with the new advertising approach, the number of requests for statistical consulting we had previously was recovered, given the big jump that occurred in 2022.

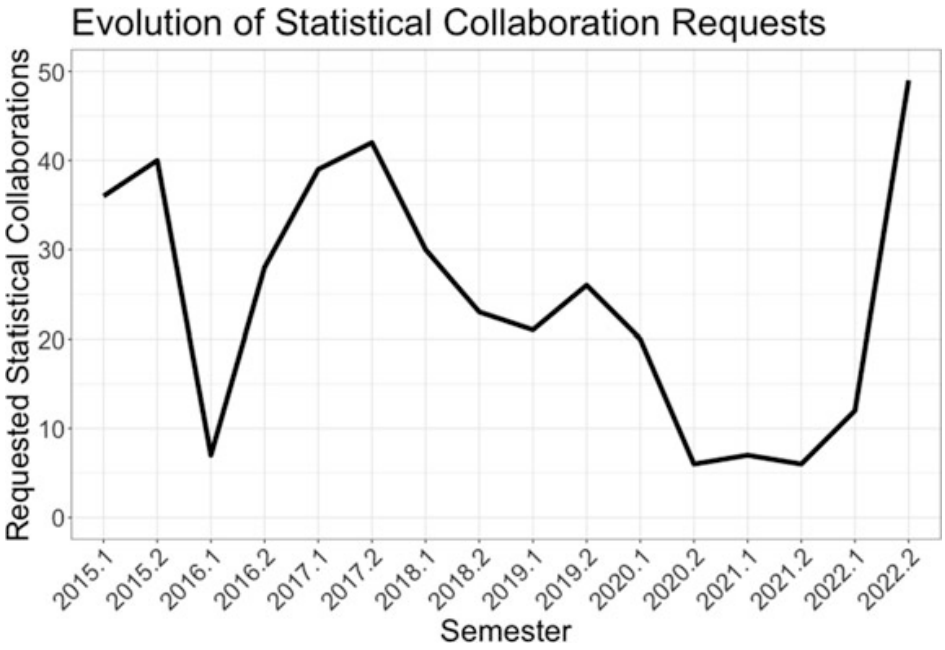

Fig. 2 Number of statistical collaboration requests LEA received per semester from the first semester of 2015 until the second semester of 2022

Table 1 Number of statistical collaboration requests by knowledge field and semester

Field knowledge	2020.2	2021.1	2021.2	2022.1	2022.2
Health sciences	1	1	0	5	22
Applied social sciences	1	2	3	3	8
Human sciences	1	1	2	4	7
Exact and earth sciences	2	1	0	0	4
Biological sciences	0	1	0	0	4
Engineering	1	1	0	0	1
Linguistics, letters, and arts	0	0	0	0	2
Agricultural sciences	0	0	0	0	1

Table 2 Number of statistical collaboration requests by Brazil region and Portugal, institution, and semester

Region	Institution	2020.2	2021.1	2021.2	2022.1	2022.2
Northeast	UFRN	5	7	6	11	36
	UFPE	0	0	0	0	3
	UFBA	0	0	0	0	1
South	UFRGS	0	0	0	0	7
	UFSM	0	0	0	1	0
	Hospital	0	0	0	0	1
Southeast	UFSCAR	1	0	0	0	0
Portugal	University of Coimbra	0	0	0	0	1

The diversity of knowledge fields and institutions associated with the requests also increased after our experiments, as can be seen in Tables 1 and 2, respectively. This diversity provides the possibility for the students to know different knowledge fields and associated problems that require statistical analysis. In addition, we received a request from another country, Portugal, which could not be possible without the Internet and the new widespread ways to conduct online meetings.

Therefore, we believe the experiments were successful. Each student enrolled in our laboratory had one project to work on. This will help our lab to be sustainable within our department.

5 Discussion

The qualitative part of these results was as expected. We believed that the advertising would lead to an increase in the number of received statistical collaboration requests when compared to the number of requests made during the pandemic. We did not receive (and did not expect to receive) a number of requests similar to what we had before 2020, 90% larger than the pandemic average. In the quantitative sense, the results were unexpected.

However, we used only Instagram stories as an advertising tool during the first half of the experiment. Due to Instagram stories' nature, they disappeared after 24 h and not many people were impacted by then. We used Facebook and WhatsApp only after the first half of the experiment duration had passed because Instagram alone was not bringing enough collaboration requests. In the future, we will use Instagram posts and stories, Facebook, and WhatsApp from the beginning. Therefore, from now on, we will advertise our laboratory every semester using more than one online social media and social network service. This is the advice we have for a stat lab that wants to run an experiment similar to this one. Notice that it is not possible to compare our experiment with a control group, *i.e.*, there is no way to know if our demand increased because of our advertising or if it was just the normal behavior that would happen anyway after the number of COVID-19 cases decreased.

Thanks to the advertising, we believe LEA, which was already on the path of a strong and sustainable laboratory, became even stronger. The results show that the lab became better known within the university. Besides that, after testing Instagram, Facebook, and WhatsApp, we understand better how to use different social networks to promote LEA services.

This experiment has shown that it is possible, even in the hard times, to engage the research community around our lab in statistical collaboration projects. We were able to find other researchers after we made an active search for them, instead of waiting for them to look after us.

References

Allen, P. J., Dorozenko, K. P., & Roberts, L. D. (2016). Difficult decisions: A qualitative exploration of the statistical decision making process from the perspectives of psychology students and academics. *Frontiers in Psychology, 7*, 188.

Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. *Journal of Marketing Science, 48*, 79–95.

Awe, O. O., & Vance, E. A. (2014). Statistics education, collaborative research, and LISA 2020: A view from Nigeria. In *Sustainability in statistics education. Proceedings of the Ninth International Conference on Teaching Statistics (ICOTS9)* (pp. 3–4).

Bangdiwala, S. I., Amarillo, M. L., Ughade, S., Rodríguez, M. N., Singer, J. M., Muñoz-Navarro, S. R., Komoltri, C., & Cumsille-Garib, J. F. (2002). Teaching consultancy through direct experience in research: The approach of the Department of Biostatistics at the University of North Carolina at Chapel Hill. In *In proceedings of the Sixth International Conference on Teaching Statistics (ICOTS6)* (pp. 1–5).

Bernstein, P. L. (1996). *Against the gods: The remarkable story of risk*. Wiley.

Geller, N. L. (2011). Statistics: An all-encompassing discipline. *Journal of the American Statistical Association, 106*(496), 1225–1229.

IBGE. (2021). *"Panorama Natal" (in Portuguese)*. https://cidades.ibge.gov.br/brasil/rn/natal/panorama. Accessed on 16 Nov 2022.

LISA. (2020). *About*. https://www.lisa2020.org/about. Accessed on 1 Mar 2023.

Marek, P., Christopher, A. N., & Walker, B. J. (2004). Learning by doing: Research methods with a theme. *Teaching of Psychology, 31*(2).

Nunes, M. A. (2022). Modernizing the curricula of statistics courses through statistical learning. In O. O. Awe, K. Love, & E. A. Vance (Eds.), *Promoting statistical practice and collaboration in developing countries* (1st ed., pp. 351–362). Chapman and Hall/CRC.

Stadtfeld, C., Vörös, A., Elmer, T., Boda, Z., & Raabe, I. J. (2019). Integration in emerging social networks explains academic failure and success. *Proceedings of the National Academy of Sciences, 116*(3), 792–797.

Russell, K. G. (2001). The teaching of statistical consulting. *Journal of Applied Probability, 38*(A), 20–26.

UFRN. (2022). *Sobre a UFRN (in Portuguese)*. https://ufrn.br/institucional/sobre-a-ufrn. Accessed on 16 Nov 2022.

Vance, E. A. (2015a). Recent developments and their implications for the future of academic statistical consulting centers. *The American Statistician, 69*(2), 127–137.

Vance, E. A. (2015b). The LISA 2020 program to build statistics capacity and research infrastructure in developing countries. In *Proceedings of the International Statistical Institute's 60th World Statistics Congress*.

Vance, E. A., Love, K., Awe, O. O., & Pruitt, T. R. (2022). LISA 2020: Promoting statistical practice and collaboration in developing countries. In O. O. Awe, K. Love, & E. A. Vance (Eds.), *Promoting statistical practice and collaboration in developing countries* (1st ed.). Chapman and Hall/CRC.

Vivacqua, C. A., Pinho, A. L. S., Nunes, M. A., & Vance, E. A. (2018). Integrating collaboration, communication and problem solving to promote innovation in statistics education. In *Looking back, looking forward. Proceedings of the Tenth International Conference on Teaching Statistics (ICOTS10)* (pp. 1–5).

Zahn, D., Smith, H., Stallings, J., Stinnett, S., & Vance, E. A. (2013). Understanding and improving the client-consultant interaction. In *Joint statistical meetings, Montreal, Canada*.

Zander, L., Brouwer, J., Jansen, E., Crayen, C., & Hannover, B. (2018). Academic self-efficacy, growth mindsets, and university students' integration in academic and social support networks. *Learning and Individual Differences, 62*, 98–107.