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Gender inequality in public university: the practice of professors of agricultural science[I]

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Abstract

This study has aimed to analyze gender inequality among professors of Centro de Ciências Agrárias (CCA – Agricultural Science Center), Universidade Federal de Viçosa (UFV), to identify the factors that could influence this gender bias. We sought not only to describe gender inequalities in the spaces occupied by men and women in undergraduate and graduate programs of CCA/UFV, but also to understand the mechanisms through which gender differences were perpetuated. To this end, we used the Lattes Curriculum of professors as a source of information for the analysis of the variables that showed different patterns between professors of both sexes who worked in the graduate programs in the field of agricultural science at UFV. The analysis of data on the distribution by sex also in undergraduate courses of CCA aimed to present a comprehensive overview of gender configurations at all academic levels: undergraduate and graduate education, as well as faculty. The big clue that guided the final conclusions of this research was the perception that professors' original link was related to the guidance standards set by professors in the graduate program.

Keywords

Gender – Agricultural science – Anticipatory socialization.

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Desigualdades de gênero na universidade pública: *a prática dos docentes das ciências agrárias em estudo*[I]

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Resumo

Este estudo teve como objetivo analisar as desigualdades de gênero existentes entre os docentes do Centro de Ciências Agrárias (CCA) da Universidade Federal de Viçosa (UFV), procurando identificar os fatores que poderiam influenciar esse viés de gênero. Buscou-se não apenas descrever as desigualdades de gênero nos espaços ocupados por homens e mulheres nos cursos de graduação e nos programas de pós-graduação do CCA/UFV, mas também compreender os mecanismos através dos quais as assimetrias de gênero se perpetuavam. Para tanto, utilizou-se o Currículo Lattes dos professores como fonte de informação para a análise das variáveis que apresentavam padrões diferenciados entre os docentes de ambos os sexos que atuavam nos programas de pós-graduação no campo das ciências agrárias na UFV. A análise dos dados relativos à distribuição por sexo também nos cursos de graduação do CCA visou a apresentar uma perspectiva completa das configurações de gênero em todas as instâncias acadêmicas: graduação, pós-graduação e docência. A grande pista que guiou as conclusões finais desta pesquisa foi alcançada a partir da percepção de que o vínculo de origem do docente mostrava relação com os padrões de orientação estabelecidos pelos professores na pós-graduação.

Palavras-chave

Gênero – Ciências agrárias – Socialização antecipatória.

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Introduction

This study was motivated by the observation of a gender disparity in the faculty of graduate programs of Centro de Ciências Agrárias (CCA – Agricultural Science Center), Universidade Federal de Viçosa (UFV), in Minas Gerais state, Brazil. In 2013, there were two hundred advisors in the nine programs which had had doctoral education for at least ten years in that center. Of these two hundred professors, 180 (ninety percent) were men and 20 (ten percent) were women. By observing in a little more depth, analyzing the entry and exit of undergraduate and graduate students at CCA, we also found a clear gender bias. The purpose of this article is to describe the situation and understand the mechanisms involved in the institutionalization of gender inequality in the field of agricultural science at UFV.

Studies such as Rosemberg (2001), Melo and Lastres (2004), Saavedra et al. (2011), Saboya (2013), among many others, carried out specifically in graduate education, have shown that, despite the significant growth in the number of women at this level of education, the percentage of women who teach in graduate education is much smaller than that of the men who do it. In addition, the participation of female graduate students and female researchers in the production and generation of knowledge is still rather unbalanced in comparison to that of male researchers in the Brazilian university system. However, beyond this quantitative gender bias in the occupation of academic space by men and women, there are also differences with regard to how they act and to the positions they have in their academic path.

The importance of this research lies in the fact that it sought to understand the mechanisms established internally in the academy, which reproduce the sexual biases of society, and to allow perceiving the ways to break this vicious cycle. Studies such as Keller (1989), Schiebinger (1989), Barral et al. (1999), Harding (1991), Rosemberg (2001) and Saboya (2013), in the field of sociology of scientific knowledge, have since the 1980s indicated the presence of sexual stereotypes in the various phases of science: from the choice of the problem to be investigated to the selection of explanatory theories, used differently by men and women. In this research, at first, we were interested in collecting data on the position of men and women, from undergraduate programs to faculty, considering the courses in the field of agricultural science at Universidade Federal de Viçosa (UFV). In a second phase, we sought to identify the paths of research professors, of both sexes, from undergraduate programs to teaching, as well as their productivity, linking productivity to the mechanisms by which it was projected, which are expressed as publications in journals, academic statuses and positions held.

Theoretical framework

The theoretical framework for the investigation of the phenomenon of the place of women in a particular profession, in this case, the university teaching career in the field of agricultural science, may be conceptually anchored in symbolic interactionism, which draws attention to internal differentiations within professions. According to Hughes (1958), cited by Dubar (2005, p.180):

> Every profession tends to constitute a peer group with its informal code, selection rules, interests and common language and to secrete professional stereotypes, actually excluding those who do not correspond to them.

According to Hughes' perspective (1996), stereotypes are organized around characteristics related to sex, color, ethnicity, religion, and social class. For the author, the struggle of social minorities to enter certain professions does not suppress stereotypes; it just moves them, which results in professional hierarchies between the holders of the ideal

desirable type and those who belong to social minorities, who occupy devalued sub-positions. Thus, applied to the case in question – female advisors in the field of agricultural science –, we might expect such derivations of professional stereotypes to put them at less noble functions within the university teaching career and in scientific research than those of male advisors, which would lead to inequality in the positions held throughout their careers. Hughes (1996) conducted studies with female doctors,

> showing how they were often confined to the care of children and were called hendoctors, in an internal hierarchisation of the professional group, which reserved the essence of the career to the professionals who had features in accordance with the dominant stereotype (DUBAR, 2005, p. 181).

Hughes (1996, p. 54) draws attention to the "constitution of reference groups within the profession". For the author, the reference group is used to define the profile of the desirable professional within each career and works as a mechanism of selection of the initiates and of projection of the professional model that such initiates should follow. This process of formation of the professional model to follow, by the "selected initiates", describes the phenomenon of "anticipatory socialization" described by Merton (1987), according to which individuals internalize and use as reference the values of the group they want to belong to. According to the author, such social identification process stems from a logic of relative frustration, through which individuals compare themselves to the members of the reference group with higher status, seeking then to shape an identity for themselves based not on the group they belong to, but on their reference group. This phenomenon applies well to groups that have the possibility of great social mobility.

What both Merton (1987) and Hughes (1996) drew attention to, respectively, by referring to "anticipatory socialization" and to "reference group", was the existence of a kind of "selective planning", which directs the "initiates identified" who display the appropriate characteristics and the desired degree of engagement in typical tasks of the profession to follow the path of the "reference group". The initiates who display the stereotypes that identify them as neophytes of the profession and, therefore, as capable of following the career of their masters, are then guided in their paths, which results in an "operational fecundity" in their academic and scientific performance, such as: participation in fieldwork with advisors, research fellowships, publication in journals in partnership with their professors etc. Hughes (1996) refers to this process as a mechanism of distribution of different professional profiles at various hierarchical levels within the career. Such hierarchical distribution within the career becomes effective as a result of the fecundity degree with which different graduates operate the intellectual capital intended for them in the academic field.

The problems that women still face today to establish themselves in science are related to the fact that knowledge and erudite culture are associated with masculine attributes. Studies such as Dubar (2005) aimed to understand the social and professional identities of men and women indicate that a child's environment is an important factor in the refinement of aptitudes and preparation of future interests. The factors that lead girls and boys to take an interest in or to reject science as a career are worked on from early. According to Schiebinger (2001), adults tend to give toys that reinforce gender stereotypes to children before children can express their preferences.

The stereotypes experienced within the family unit are also present in schools. As Silva (2010) states, in the school, from an early age, children's capacities are directed to strengthen attributes regarded as typical of each sex. Therefore, the school delimits spaces, stating what boys can or cannot do, making children introject symbols and codes with a gender bias.

In this sense, universities have not been different from the school. Since the foundation of the university in the twelfth century until the late nineteenth century and, in some cases, until the early twentieth century, women were excluded from education. A few women, however, studied and taught in universities from the thirteenth century on, first in Italy. They often thrived in fields such as physics and mathematics, which are now considered especially resistant to women's incursions (SCHIEBINGER, 2001). However, the situation of these women became even more difficult among Darwinist doctors and psychiatrists, who, according to Sedeño (2006, p. 43, our translation), stated that:

> For them the woman was not a human being with a specific role in the reproductive process of the species; she was, therefore, *a human variety specialized in reproduction*. Women were intuitive and instinctive, men were different because in them the instincts and emotions were controlled by rational intellect.

In the early 1980s, Rossiter (1982) proposed two concepts to understand the mass of statistics on women in science and the disadvantages they continued to suffer. The first concept is *hierarchical segregation*, the known phenomenon according to which the more one climbs the ladder of power and prestige, the fewer female faces one sees. This notion may be more useful than *glass ceiling*, which points to the supposedly invisible barrier that prevents women from reaching the top. The notion of hierarchical disparities draws attention to the multiple steps in which women are excluded when they try to climb academic or industrial ladders. Zuckerman and Cole (1991) dedicated themselves to studying the enigma of academic productivity regarding the difference between the sexes in scientific production. They evidenced that, for a group of scientists who obtained their doctoral degrees in 1970, the rate of women's publications was about half that of men in all fields of science. Zuckerman and Cole (1991) found that gender differences in publications began early in career and grew with the maturing of scientists. According to the authors' study, twelve years after women obtained their doctorate degree, 22 percent of them had not published a single scientific paper. This rate fell by half among men. The study also pointed out that, regardless of women's productivity, they were not rewarded in the same way men were, with pay raises and positions. Also, the movement of funds for research conducted by women was lower than that of men. Along those same lines, Acker (2003) points to a male culture around work, involving the production of scientific and technological knowledge, as well as academic management.

Methodology

In terms of objectives, this research can be characterized as descriptive and explanatory, because it has sought not only to describe gender inequalities in the spaces occupied by men and women in undergraduate and graduate programs– as well as in faculty in the graduate programs of Centro de Ciências Agrárias (CCA), UFV –, but also to identify the mechanisms by which these gender differences are perpetuated. The study had a cross-sectional character, and data collection in Curriculum Lattes was punctual, in 2013. However, despite its cross-sectional character, it gathered data on the entire path of the researcher at the institution, since his or her entry into the institution until 2013, the limit year of the analysis.

The research we carried out was broader than what is presented in this article. In the latter, we have highlighted the variables that showed they were more related to the processes of institutionalization of gender inequalities in the field of agricultural science at Universidade Federal de Viçosa, namely: where professors received their education (bachelor's, master's, doctoral and post-doctoral degrees); and the relationship between the sex of the advisor

and the distribution of advisees at all levels of training as a researcher (undergraduate, master's, doctoral and postdoctoral levels). However, in the broader research, we also analyzed other variables: how long professors had been in the institution; how long they had been advisors; the number of articles they had published since the beginning of 2013, considering the articles published only with men and only with women; and the status attributed by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes – Higher Education Personnel Improvement Coordination) to researchers according to their productivity.

Therefore, regarding professors, the first step of the research was to save the Curriculum Lattes of each researcher who worked in the nine programs of CCA. We considered 2013 the limit year for calculating the data of each Curriculum Lattes. The collection of the data on the Curriculum Lattes of each of the two hundred professors who worked at CCA graduate education in 2013 took about six months. There may have been a little distortion in the data, because a professor whose data were collected at the beginning of the investigation may have published something later, which was not included. However, this distortion can be considered minimal, since we considered the production throughout the academic life of the professor, which ultimately reveals a pattern, which was detected by data collection. It was also necessary not to repeat the data regarding the curricula of the professors who worked in more than one graduate education program. In this case, professors were considered members of the program in which they had been working the longest.

As for the data on students in the undergraduate courses and graduate programs, we considered only sex and how they were distributed in five undergraduate majors at CCA – Agronomy, Cooperativism, Agricultural and Environmental Engineering, Forest Engineering, and Zootechnics –, as well as in the nine graduate programs of CCA which had had doctoral programs for at least ten years – Forest Engineering, Applied Economics, Agricultural Engineering, Plant Pathology, Plant Science, Genetics and Breeding, Agricultural Meteorology, Soils and Plant Nutrition, and Zootechnics. The requirement of having offered doctoral programs for at least ten years was established because one of the specific objectives of this research was to analyze the profile of guidance of male and female professors both in undergraduate research and in master's, doctoral and post-doctoral programs. The rationale for choosing CCA was the fact that it has offered programs for over fifty years and has had a clear sexist bias at all levels of academic life.

As for analysis methodology, we used the program Statistical Package for the Social Science (SPSS) to conduct statistical analyses. The program was basically used to make cross-analysis between variables, considering, for example, the sex of the professors and the number and sex of their advisees at undergraduate, master's, doctoral and postdoctoral levels; the sex of professors and the number of partnerships with men and women in articles; and the sex of professors and their statuses as researchers according to Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq – National Council of Scientific and Technological Development), among many other analyses crossing variables.

Results and analysis

Initially, the data collected in the study had a descriptive character, presenting the distribution of students by sex in their respective programs, both at undergraduate and graduate levels. Table 1 allows us to observe the number of students who enrolled and students who graduated in all the majors in the field of agricultural science, in the first and second semesters, from 2010 to 2014. It shows a tendency to the stability of percentages of students entering and leaving: men with a

percentage next to sixty percent when entering and leaving, and women with a figure close to forty percent both when entering and leaving. This situation is in accordance with Hughes' thesis (1996), who states that one can expect a probable path along a vocational training when it is built on stereotypes of sex, color, ethnicity or others, which shape the ideal type of professional. By observing the path of training of students, the following hypothesis can be considered plausible: the system of opportunities for male and female students can be permeated by a "system of legitimate expectations" (HUGHES, 1996), which is built on the sexual stereotype of the professional desirable to the area.

Table 1 – Undergraduate school – Number of students who enrolled and students who graduated in the field of agricultural science – Viçosa Campus (1st and 2nd semesters 2014)

Years	Students enrolled						Students who graduated					
	1st semester			2nd semester			1st semester			2nd semester		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
2010	1405 60%	929 40%	2334 100%	1303 60%	880 40%	2183 100%	91 66%	47 34%	138 100%	97 55%	79 45%	176 100%
2011	1453 61%	941 39%	2394 100%	1361 61%	880 39%	2241 100%	100 65%	53 35%	153 100%	139 65%	73 35%	212 100%
2012	1430 60%	947 40%	2377 100%	1298 60%	863 40%	2161 100%	88 63%	52 37%	140 100%	103 56%	82 44%	185 100%
2013	1481 61%	957 39%	2438 100%	1363 61%	879 39%	2242 100%	76 59%	53 41%	129 100%	97 54%	82 46%	179 100%
2014	1497 61%	957 39%	2454 100%	1363 61%	882 39%	2245 100%	78 65%	42 35%	120 100%	-	-	-
Mean	61%	39%	100%	61%	39%	100%	64%	36%	100%	57%	43%	100%

Source: Research data (2014)

When one analyzes scientific training in graduate education, it is clear that gender bias remains. We reached this conclusion when we considered the students who enrolled in 2013, in order to have an overview of sex distribution. The survey of this datum was done by adding the students who enrolled in nine graduate programs of CCA which had existed for over ten years. Table 2, presented below, shows the total number of advisees, according to the sex and the level of scientific training (undergraduate, master's, doctoral and postdoctoral levels) of each of the two hundred advisors surveyed, from the beginning of their guidance activities until 2013. The table shows a higher percentage of men than of women at all qualification levels. The continuous growth of these percentages as one advances in qualification draws attention. This percentage increases among men from undergraduate research to master's and from master's to doctorate, while among women exactly the opposite happens: a decrease. The exception was the post-doctoral level, which had a higher percentage of qualification among female professors. Such investment at this level of education may indicate a female researchers' strategy to increase their opportunities in the academic career.

Table 2 – Distribution of advisees in agricultural science programs of UFV, considering sex, level of scientific training and total sum per advisor until 2013

Undergraduate research			Master's			Doctorate			Post-doctorate		
M	F	T	M	F	T	M	F	T	M	F	T
2046	1107	3153	2349	1213	3562	1500	669	2169	192	131	323
65%	35%	100%	66%	34%	100%	69%	31%	100%	59%	41%	100%

Source: Research data (2014).

The continued growth in the education of men and the continued decrease in the education of women from undergraduate research to doctorate could indicate, on the one hand, the influence of socially assigned gender roles on the academy. One could believe that male researchers have a perspective and/or a possibility of continuing professional education due to social perspectives, which link their work functions to the public sphere. On the other hand, one could believe that a woman's investment in her career is inhibited by the social roles that guide her to the private sphere. However, research carried out by several authors, such as Leta (2003), suggest that this is not a plausible interpretation, because, in terms of career, the percentages related to female researchers with up to two children are not different from those related to female researchers without children. Therefore, domestic responsibilities, in themselves, could not be considered an explanation for the asymmetries between men and women as qualification levels increase in the field of agricultural science. Consequently, seeking to understand the internal mechanisms of the academy through which gender biases are reproduced becomes even more important.

Table 3 shows exactly this asymmetric gender universe in the area of agricultural science, by displaying the number of male and female researchers of the graduate programs of CCA. Among the two hundred research professors who worked in graduate programs in the field of agricultural science at UFV in 2013, 180 were men, which corresponded to ninety percent of the total, and twenty were women, which corresponded to only ten percent of research professors. The table below shows more specifically the sexual differentiation in each of the nine graduate programs of the CCA/UFV, and reveals a much higher proportion of men than of women in them.

Table 3 – Sex of the professor per graduate education program

		Sex of the professor		Total
		Male	Female	
Graduate Education Programs	Soils	20 (87%)	3 (13%)	23(100%)
	Agricultural Engineering	25 (89%)	3 (11%)	28 (100%)
	Applied Economics	9 (82%)	2 (18%)	11 (100%)
	Agricultural Meteorology	3 (100%)	0 (0%)	3 (100%)
	Plant Science	33 (94%)	2 (6%)	35 (100%)
	Genetics and Plant Breeding	24 (89%)	3 (11%)	27 (100%)
	Plant Pathology	15 (88%)	2 (12%)	17 (100%)
	Zootechnics	27 (90%)	3 (10%)	30 (100%)
	Forest Engineering	24 (92%)	2 (8%)	26 (100%)
	Total	180 (90%)	20 (10%)	200 (100%)

Source: Research data (2014)

We sought to complement the descriptive character of the research with analyses from an explanatory perspective. To this end, we considered, as one of the variables that could influence the configurations of gender biases in the field of agricultural science of UFV, the place where the professor received undergraduate, master's and doctoral education. In the data presented, it is noteworthy that, among male professors, 73 percent graduated from the institution where they teach today, whereas, in the case of female professors, this percentage drops to 35, i.e., less than half the percentage of men.

Table 4 – Institution where professors received undergraduate, master's and doctoral education, according to the sex of the professor

Undergraduate			Education level					
			Master's		Doctoral			
Place	UFV	M	131	73%	138	77%	69	38%
		W	7	35%	11	55%	7	35%
		T	138	69%	149	75%	76	38%
	Outside UFV	M	45	25%	31	17%	35	19%
		W	13	65%	31	17%	35	19%
		T	58	29%	9	45%	7	35%
	Abroad	M	4	2%	11	6%	76	42%
		W	0	0%	0	0%	6	30%
		T	4	2%	11	6%	82	41%
Total		M	180	90%	180	90%	180	90%
		W	20	10%	20	10%	20	10%
		T	200	100%	200	100%	200	100%

Source: Research data (2014)

The percentage of female professors who did their master's in the institution in which they became professors was more significant (55 percent) than that of those who graduated from the institution where they became professors (35 percent). But this percentage was much higher in the segment of the men who did their master's in the institution where they became professors (77 percent). This fact, in the case of men, seems to point to a juxtaposition of master's and undergraduate education, which have very similar percentages; in fact, only four percent of those who did their master's in the institution in which they became professors had not graduated from the same institution. Therefore, it appears that among men institutional endogamy is already manifest at undergraduate level, while among women it is much smaller and becomes a little more significant only at the master's level.

With regard to doctorates, among men there was a higher percentage of professors who did their doctorate abroad and not at their home institution. This finding points to the possibility of the strength of sociability related to the links, in undergraduate and master's education, for the individual to become a professor. Thus, doing their doctorate outside Brazil, for men, could already occur within a network of contacts and relationships that enable individuals to return to their home institution and rise to the professor condition, in case they did not have it at the time of their departure for the doctorate.

When we linked the place of the master's to teaching at the same university, the percentage among men was still a little higher than that found in undergraduate education (77 percent), while among women that percentage remained lower (55 percent), although it was far superior to that found in undergraduate education. Therefore, to the undergraduate group who became professors was added a small percentage that had not graduated from the home institution. In the case of women, the master's weighed more than undergraduate studies, and a significant part of these female master's students who later became professors graduated from another institution.

Thus, it was found that the origin of the male professor, i. e., the fact that he graduated from the institution in which he became a professor, results in a percentage of approval for university teaching twice as high as that of women. The argument of Merton (1996) about "anticipatory socialization" seems to apply perfectly to this situation, in which undergraduate education, in men's case, includes them in a reference network that socializes them in the direction of their future status of professors. In this process of "anticipatory socialization", there takes place a planned orientation in terms of the selection of activities and links that qualify them in a differentiated manner from that which occurs with women, who, throughout academic education, are not so included in networks formed by the "reference professors" of the courses with the strongest professional profiles.

Moreover, one cannot ignore that, among women who became professors, the percentage of women who were trained outside UFV is much higher than that of men. Therefore, the questions that need to be answered are: 1) Why is the original link of men in undergraduate studies so much more significant than that of women?; and 2) How does this original link become an intellectual capital for future professors? Perhaps we should begin by answering the second question, which would help answer the first one.

When considering the characteristics of the guidance by male and female professors in undergraduate research, it was found that female professors guided a higher percentage of students at this level than male professors did: sixty percent of the female professors guided more than fifteen students, while, among male professors, 66 percent guided less than fifteen students throughout their academic career. A reverse trend was thus observed: female professors guided more students at undergraduate research level than male professors did. Table 5, which follows, seeks to analyze specifically how the link between professors and students in undergraduate research is established, emphasizing gender bias. The table allows viewing how male and female professors guide male and female students in undergraduate research.

Observing Table 5, one can note that there was a greater tendency for male professors to guide more men in undergraduate research than women. The percentage of male professors who guided up to five male students at undergraduate research level was 69.4, which was significantly higher than in the case of female students, 50.6 percent. In contrast, the percentage of female professors who guided male students in undergraduate research remained very similar to that of female students, that is, female professors tended to guide proportionally students of both sexes in undergraduate research. Although it can be argued that the number of male students is higher than that of female students, the percentage of female advisors is only ten and they are the main advisors of women students at undergraduate research level.

Table 5 – Number of undergraduate research advisees according to the sex of the professor

Number of undergraduate research advisees	Sex of the professor who advised *male advisees*		Total number of male advisees	Sex of the professor who advised *female advisees*		Total of female advisees
	Male	Female		Male	Female	
0-5	91 (50.6%)	7 (35%)	98 (49%)	125 (69.4%)	6 (30%)	131 (65.5%)
6-10	34 (18.9%)	6 (30%)	40 (20%)	30 (16.7%)	11 (50%)	41 (20%)
11-15	24 (13.3%)	1 (5%)	25 (12.5%)	16 (8.8%)	1 (5%)	17 (8.5%)
16-20	14 (6.2%)	2 (10%)	16 (6.5%)	4 (2.3%)	1 (5%)	5 (2.5%)
21-30	12 (6.9%)	0 (0%)	12 (6%)	3 (1.7%)	1 (5%)	4 (2%)
31-40	4 (2.3%)	2 (10%)	6 (3%)	1 (0.6%)	0 (0%)	1 (0.5%)
41-50	0 (0%)	1 (5%)	1 (0.5%)	1 (0.6%)	1 (5%)	2 (1%)
51-100	3 (1.8%)	1 (5%)	4 (2.5%)	0 (0%)	0 (0%)	0 (0%)
61-190	1 (0.6%)	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)
TOTAL	180 (100%)	20 (100%)	200 (100%)	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

Taking analysis to the master's level, we noticed a counter trend to that of undergraduate research: male professors guided a greater number of students than female professors did. Taking into account that the male professors who work in graduate education in the field of agricultural science represent ninety percent of the advisors in graduate education and that nearly sixty percent of them had not guided more than five women students at the master's level throughout their academic life, one can say that there is a gendered selection, which favors male students in the development of their intellectual capital within the academic field. Even though there are more male students than female ones, female professors who work in CCA graduate programs, and account for only ten percent of faculty members, tend to guide more women throughout their academic career than male professors do. However, among female professors, we do not notice sociability between equals, as they guide more male students than female ones. Finally, the data allow us to state that female students are not accepted in male guidance networks, which include predominantly male students. Therefore, it is reasonable to assert that male sociability between male professors and male students is the result of a choice of the former, whereas the female sociability established between female students and female professors is almost a destiny. The doors open for female students to enter the master's are those of the female professors, who also welcome male students, at an even higher percentage.

Table 6 – Number of female master's advisees according to the sex of the professor

Number of female master's advisees	Sex of the advisor		Total
	Male	Female	
0-5	107 (59.3%)	9 (40%)	116 (58%)
6-10	54 (29.9%)	5 (25%)	59 (29.5%)
11-15	11 (6.2%)	5 (25%)	16 (8%)
16-20	3 (1.8%)	1 (5%)	4 (2%)
21-30	3 (1.7%)	0 (0%)	3 (1.5%)
31-40	1 (0.6%)	0 (0%)	1 (0.5%)
41-50	1 (0.6%)	0 (0%)	1 (0.5%)
TOTAL	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

Observing the relationship of male professors with male master's advisees, one notices that the situation is completely different from that established with female master's students: 23.6 percent of them guided over fifteen male master's students, while only 4.7 percent guided over fifteen female master's students. The tendency for male professors to guide a larger number of male master's students becomes clear when one contrasts the 23.9 percent who guided up to five male master students to the 76.1 percent of those who guided more than five male master's advisees. However, when one notes that ten percent of the female professors guided over fifteen male master's students, one realizes that this percentage is twice the number of female students guided. This suggests that while female professors are potentially the most numerous advisors of female master's students, they actually guided a higher percentage of male master's students. This may indicate that, on the part of female professors, there is no professional sociability marked by belonging to the same sex, as it occurs among men.

Table 7 – Number of male master's advisees according to the sex of the professor

Number of male master's advisees	Sex of the advisor		Total
	Male	Female	
0-5	43 (23.9%)	6 (30%)	49 (24.5%)
6-10	45 (24.9%)	7 (35%)	52 (26%)
10-15	50 (28.2%)	5 (25%)	55 (27.5%)
16-20	19 (10.6%)	1 (5%)	20 (10%)
21-30	15 (8.3%)	1 (5%)	16 (8%)
31-40	4 (2.3%)	0 (0%)	4 (2%)
41-50	2 (1.2%)	0 (0%)	2 (1%)
51-60	1 (0.6%)	0 (0%)	1 (0.5%)
61-80	1 (0.6%)	0 (0%)	1 (0.5%)
TOTAL	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

It was also observed that, among male professors, gender inequalities also affect the field of possibility of guidance. In doctoral guidance, which has greater weight in the professional career of professors than master's guidance, due to the superiority of the education level and the quality of publications, the situation is, in fact, even more clear with respect to this trend. In Table 8, which follows, one notices that more than half the female professors concentrated their doctoral guidance at the level with the fewest advisees, up to five, while nearly thirty percent of the male professors had more than fifteen advisees. Therefore, in terms of trend, there is an opposition: at the level with the lowest number of doctoral advisees, there are 55 percent of the female professors, and, at the level of the highest number, there are thirty percent of the male professors. But what may this opposition indicate? Some hypotheses seem plausible: (a) male professors manage to qualify to guide doctoral advisees earlier than female professors; (b) earlier qualification establishes a virtuous circle, because it results in scientific productivity, which leads to having more advisees. However, this reality, thirty percent of male professors with more than fifteen doctoral advisees, cannot overshadow the reality of the intermediate level, of those who have from eleven to twenty advisees. At this intermediate level, the percentage of male professors and female professors favors slightly the latter: a significant number of female professors, forty percent, can be at the same guidance level as 35 percent of the male professors.

Table 8 – Number of doctoral advisees according to the sex of the professor

Number of doctoral advisees	Sex of the advisor		Total
	Male	Female	
0-5	54 (30%)	11 (55%)	65 (30.5%)
6-10	45 (25%)	1 (5%)	46 (23%)
11-15	31 (17.2%)	5 (25%)	36 (18%)
16-20	32 (17.6%)	3 (15%)	35 (17.5%)
21-30	13 (7.3%)	0 (0%)	13 (6.5%)
31-40	2 (1.2%)	0 (0%)	2 (1%)
41-50	2 (1.2%)	0 (0%)	2 (1%)
51-60	1 (0.6%)	0 (0%)	1 (0.5%)
TOTAL	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

When analyzing more closely the situation of female doctoral advisees, we realized that 81.7 percent of the male professors did not guide more than five women, while among female professors this figure was lower: 75 percent. Again, at the doctoral level, female professors also tended to guide more women than male professors did, since 25 percent of the former guided more than five female doctoral students and only 18.5 percent of the male professors did it.

Table 9 – Number of female doctoral advisees according to the sex of the professor

Number of female doctoral advisees	Sex of the advisor		Total
	Male	Female	
0-5	147 (81.7%)	15 (75%)	162 (81%)
6-10	28 (15.6%)	4 (20%)	32 (16%)
11-15	2 (1.1%)	1(5%)	3 (1.5%)
16-20	1 (0.6%)	0 (0%)	1 (0.5%)
21-30	2 (1.1%)	0 (0%)	2 (1%)
TOTAL	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

Among male professors, 81.7 percent of them did not guide more than five female doctoral advisees, but, for male doctoral students, this figure fell to 43.4 percent, that is, 56.6 percent of the male professors guided more than five male doctoral advisees, while among the female doctoral advisees this percentage is 18.3 percent, approximately three times smaller. However, among female professors, the percentage of those who guided more than five male doctoral advisees was higher than that of the ones who guided female doctoral advisees: thirty percent and 25 percent respectively. This reinforces the hypothesis that it is not the sociability between people of the same sex that explains why female professors guide more women than male professors do at all levels, since the percentage of female advisees is smaller than that of male advisees. In other words, female professors guided more men than women, although they were the most frequent advisors of female students.

Table 10 – Number of male doctoral advisees according to the sex of the professor

Number of male doctoral advisees	Sex of the advisor		Total
	Male	Female	
0-5	78 (43.4%)	14 (70%)	92 (46%)
6-10	48 (26.7%)	3 (15%)	51 (25.5%)
11-15	37 (20.4%)	3 (15%)	40 (20%)
16-20	11 (6.1%)	0 (0%)	11 (5.5%)
21-30	3 (1.8%)	0 (0%)	3 (1.5%)
31-40	3 (1.8%)	0 (0%)	3 (1.5%)
TOTAL	180 (100%)	20 (100%)	200 (100%)

Source: Research data (2014)

Thus, we found out a significant influence of the sex of the advisor on the sex of the advisee at the three levels of academic education which usually precede university teaching – undergraduate research, master's and doctorate –, but not at the level of education that usually takes place after becoming a professor. Based on the data analyzed, we perceived that

female professors tended to guide more students at the most basic level, undergraduate research, and to guide more women than male professors did, although they guided a greater percentage of men than that of women. This fact weakens the thesis that the influence of sociability between people of the same sex could explain the fact that male professors guide more men than women. That is, female professors guided more women than male professors did, but they guided a higher percentage of men than of women. Thus, the thesis of the influence of sociality between equals has not been confirmed for female professors.

Final thoughts

Pointing to the existence of gender asymmetries in science is in itself a very worthy goal, given the fact that the evolution of gender configurations in the scientific field has been little studied. However, the main contribution of this article lies in identifying the mechanisms through which these asymmetries become institutionalized in the academic field. The research presented in this article, carried out in graduate programs of agricultural science of Universidade Federal de Viçosa, offers the possibility to analyze gender asymmetries in science in the very institution where scientific research began in Brazil. To give visibility to *glass ceilings*, which do not allow realizing the barriers that prevent women from institutionalizing upward mobility mechanisms in the field of science, may help mitigate these gender inequalities in the generation of scientific knowledge in Brazil. Thus, the main objective of this research was to understand how gender inequalities were established within the undergraduate courses of CCA/UFV, involving the graduate programs of the center and faculty members.

When considering the first level of academic education, undergraduate courses, the research found markedly different percentages concerning the entry and exit of men and women in Agronomy, Cooperativism, Agricultural and Environmental Engineering, Forest Engineering and Zootechnics majors of CCA: the percentage of men was next to sixty in the entry and exit of the undergraduate courses, while women kept this percentage close to forty in both situations. In other words, this situation suggests that university education was not able to reverse the prevailing sexual stereotypes in society, which advocate the ideal type of profession for men and women. Agronomy and Engineering are careers with male stereotypes. In Cooperativism and Animal Science majors, the percentages of female graduates are sometimes even higher than those of men. This may indicate, according to Dubar (2005), that these courses do not have a strong "gender bias" in relation to their professional identities. According to the author, this "engendered" professional identity is fed internally, in the course of vocational training, by reference groups, a kind of professional elite that serves as a model for the selection and training of the "initiates".

But realizing this male bias in vocational training in the agricultural science majors of UFV, or even the great disparity between the number of male advisors and female advisors in the graduate education in agricultural science, does not help to understand how this phenomenon takes place or to make visible the *glass ceiling* that covers the barriers that women face to break the "hierarchical segregation" pointed out by Silva (2010). It was possible to bring out some compelling evidence through deeper analysis of mentoring relationships.

From the outset, the analysis of the first data on the distribution of male and female researchers at the four levels of science education – undergraduate research, master's, doctorate and post-doctorate – evidenced the hierarchical segregation already pointed out by Rossiter (1982) in her studies in the 1970s. The data showed a higher percentage of men than of women at all qualification levels in graduate education in agricultural science, with continued growth of masculinization as one

progressed in academic qualification, a classic case of hierarchical sex segregation.

However, the first evidence that can help weave an explanation of the mechanisms which reproduced these gender inequalities in agricultural science at UFV emerged from the data on the institution from which the professors had graduated. This data pointed to the great importance of original links in the transition to teaching. However, this did not occur among female professors: for them, undergraduate education did not have the same weight as for male professors, and the master's was a little more significant in this sense, but still showed much lower percentages than those achieved by male professors.

Since there was the influence of original link in the rise of male students to the status of professors, it was reasonable to assume that this transition had been built from the links of guidance since undergraduate research. Thus, we sought to analyze the influence of the sex of the professor in the guidance standard established with the students of both sexes. In undergraduate research, female professors guided men and women proportionally, unlike male professors, who tended to guide men. When considering the percentage of guidance in the master's, we noticed a reverse trend: male professors guided a higher number of male students than female professors did, and their advisees were mostly male. Finally, at doctoral level, male professors also tended to guide more male students.

However, the argument that the greater number of male advisees justifies the higher percentage of male advisees of male professors can be relativized when we observe that female professors, despite being in a clear minority position, are those who guide the most female advisees, although they guide even more men. This shows that even though male professors were more numerous than female professors, they did not guide more women than female professors did at any level of scientific education. That is, genderization in guidance occurred on the side of male professors who, despite being numerically superior to female professors and having the possibility of guiding more women due to their numerical superiority, did not do it. Therefore, distinctive patterns of guidance by male and female professors in relation to male and female students at all levels of training as researchers have been evidenced.

References

ACKER, Sandra. The concerns of Canadian women academics: will faculty shortages make things better or worse? **McGill Journal of Education,** Quebec, v. 38, n. 3, p. 391-405, 2003.

BARRAL, Maria José; MAGALLÓN, Carmen; MIQUEO, Consuelo; SÁNCHEZ, Maria Dolores (eds.). **Interacciones ciencia y género. Discursos y practicas científicas de las mujeres.** Barcelona: Icaria, 1999.

DUBAR, Claude. **A socialização:** construção das identidades sociais e profissionais. São Paulo: Martins Fontes, 2005.

HARDING, Sandra. **Whose science? Whose knowledge? Thinking from women's lives.** Itaca, NY: Cornell University Press, 1991.

HUGHES, Everett Cherrington. **Men and their work.** California: Free Press, 1958.

HUGHES, Everett Cherrington. Métiers modestes et professions prétentieuses: l'étude comparative des métiers. In: HUGHES, Everett Cherrington. **Le regard sociologique.** Textes choisis et traduits par Jean Michel Chapoulie. Paris: L'EHESS, 1996, p. 123-136.

KELLER, Evelyn Fox. **Reflexiones sobre género y ciéncia.** Valencia: Alfons e Magnanim, 1989.

LETA, Jacqueline. As mulheres na ciência brasileira: crescimento, contrastes e um perfil de sucesso. **Estudos Avançados**, São Paulo, v. 17, n. 49, p. 1-17, set./dez. 2003.

MELO, Hildete Pereira de; LASTRES, Helena Maria Martins. Mulher, ciência e tecnologia no Brasil. **Proyecto Iberoamericano de Ciencia, Tecnología y Género,** 2004, p. 85-88.

MERTON, Robert. **Teoría y estructura sociales.** México: Fondo de Cultura Económica, 1987.

ROSEMBERG, Fúlvia. Caminhos cruzados: educação e gênero na produção acadêmica. **Educação e Pesquisa**, São Paulo, v. 27, n. 1, p. 47-68, jun 2001.

ROSSITER, Margaret W. **Women scientists in America:** struggles and strategies to 1940. Baltimore: Johns Hopkins University Press, 1982.

SAAVEDRA, Luísa et al. (A)Simetrias de gênero no acesso às engenharias e ciências no ensino superior público. **Ex Aequo**, n. 23, p. 163-177, 2011.

SABOYA, Maria Clara Lopes. Relações de gênero, ciência e tecnologia: uma revisão da bibliografia nacional e internacional. **Educação, Gestão e Sociedade,** Jandira, v. 3, n. 12, nov. 2013.

SCHIEBINGER, Londa. **The mind has not sex? Women in the origins of Modern Science.** Cambridge: Harward UP, 1989.

SCHIEBINGER, Londa. **O feminismo mudou a ciência?** Bauru: EDUSC, 2001.

SEDEÑO, Eulalia Pérez. Las culturas de la ciencia y los análisis de género. In: SEDEÑO, Eulalia Pérez et al. **Ciencia, tecnología y género en Iberoamérica.** Madrid: Consejo Superior de Investigaciones Científicas, 2006.

SILVA, Elizabete Rodrigues da. **A (in)visibilidade das mulheres no campo científico.** Available at:<http: www.faetec.rj.gov.br/desup/images/.../v2.../art_>. Access:: 10 dez. 2010

ZUCKERMAN, Harriet; COLE, Jonathan. **The outer circle:** Women in the scientific community. Columbia: Hardcover, 1991.

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