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ANALYSIS OF THE PROFILE OF ENTRANTS TO THE COURSES OF THE POSTGRADUATE PROGRAM IN MINERAL ENGINEERING – ``UNIVERSIDADE FEDERAL DE OURO PRETO``

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Abstract: The Postgraduate Program in Mineral Engineering at ``Universidade Federal de Ouro Preto`` inserts masters and doctors into the job market and has as its pillar the development of professionals based on scientific research. This article presents an assessment of the profile of those entering the courses offered, analyzing criteria such as undergraduate education institution, participation in scientific initiation, performance in the job market, other training, among others.
Keywords: Freshmen, postgraduate studies, mining, people management, engineering

INTRODUCTION

Postgraduate courses in Brazil play a fundamental role in the country's scientific, technological and professional development. With the aim of training highly qualified professionals in different areas of knowledge, postgraduate programs impact society through contributions to the advancement of science and the development of solutions to complex problems, in addition to collaborating with the productive sector through innovations, process improvements and development of new technologies. Through these courses, the internationalization of science and education is promoted: through partnerships and exchanges, knowledge and experiences are exchanged, expanding collaboration networks and inserting Brazil into the global scientific community (NOBRE and FREITAS, 2017).

The Postgraduate Program in Mineral Engineering (PPGEM) at ``Universidade Federal de Ouro Preto`` has academic training at Master's and Doctorate levels in the areas of Mining and Ore Treatment. Located in a region with intense mining activity, the Program began in 1998 with Master's courses in the areas of Mining and Treatment, and later, in August 2015, the Doctorate course (CPPGEM-UFOP).

Currently, the undergraduate courses eligible for the Program are Engineering and related areas. Related areas are considered: Engineering, Geology, Degree and Bachelor's Degree in Chemistry and Industrial Chemistry. (CPPGEM-UFOP). We also sought to understand the motivations why other areas seek Postgraduate courses in Mineral Engineering, which is positive for the program, interrelating the areas of knowledge, bringing new discussions and adding new values to the content offered.

Given this broad scenario of courses and areas that seek Postgraduate Studies in Mineral Engineering at UFOP, there was an opportunity to carry out a study on the students who entered the Program and relate their areas of study and experiences. Assessing the profile of those entering a postgraduate program is essential, allowing the identification of the most suitable candidates for the lines of research and helping to efficiently manage resources, contributing to the quality and success of the program as a whole. This way, this work evaluates the profile of those entering courses offered by PPGEM through a questionnaire with questions about the areas of study and experiences of the interviewees, as well as their objectives with the program.

This research shows the origins, motivations and interests of people who seek PPGEM to continue their studies. The objective of this work is to serve as a basis for future discussions aimed at constantly improving the courses offered. Therefore, a questionnaire was created with 27 questions, divided into 7 interdependent sections, and disseminated to people who have completed or are taking any of the courses offered in the program.

METHODOLOGY

Research participants were submitted to a form with questions about their degree, admission to PPGEM, development of the course undertaken and motivations to further their studies in Mineral Engineering.

The form was developed on the Google Forms platform, in which 27 multiple-choice and descriptive questions were created, divided between 7 sections. The sections were designed and sequenced to follow a "chronological" order of the data provided by the interviewees, making it easier to fill out the form and making it more interactive, involving the interviewee. Therefore, the sections are:

a) Section 1: Identification of the respondent

b) Section 2: Graduation Data

c) Section 3: About joining PPGEM

d) Section 4: Reason for withdrawal (section linked to a question in section 3).

e) Section 5: Questions related to the PPGEM course

f) Section 6: For those who completed the Master's or Doctorate course at PPGEM (section linked to a question in section 5).

g) Section 7: For those who took both courses (Master's and Doctorate) at PPGEM (section linked to a question in section 5).

Table 1 presents the questions related to the respective sections. In the case of a link, the questions were directed based on the answer in the previous section. Therefore, Section 4 is dedicated to participants who dropped out of their courses and Sections 6 and 7 are aimed at cases where the candidate has completed only one of the two courses, master's or doctorate (Section 6) or both (Section 7). The questions to which the interviewees were asked, as well as the structure of the questionnaire, are outlined in Table 1, below:

For analysis criteria, regarding question 9, postgraduate courses will be divided into 3 groups: Master's, Specialization and MBA (Masters in Business Administration). Stricto sensu courses will be considered as "Masters" and "Specialization" as latu sensu courses, or for a specific area such as Geotechnics and Occupational Safety and courses with managerial purposes such as Management/ Management of Work will be classified as "MBA". Projects, Businesses or People.

RESULTS AND DISCUSSION

The survey included 55 interviewees, 26 women and 29 men, the majority of whom were mining engineers. The scope of the research can be seen in that participants took 10 different undergraduate courses prior to PPGEM, these degrees were carried out in 7 different states and 1 in Peru, with the period of graduation varying from 1999 to 2021. Figure 1 shows the origin of each interviewee, showing the relationship between the candidate and their undergraduate university:

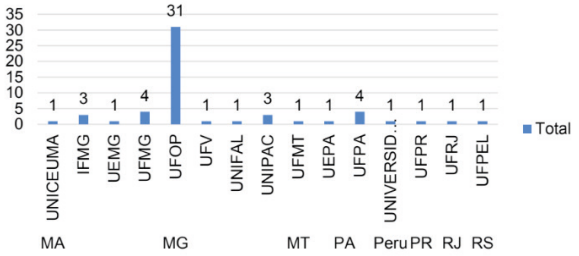


Figure 1: Undergraduate institution and respective state of the interviewee

Regarding the professional profile of students seeking the PPGEM, it was possible to observe that the vast majority are Mining Engineers (74%), but professionals from other areas also seek Postgraduate courses in Mineral Engineering (Figure 2). This professional diversity is possibly due to the demand of the job market which, at the

Section 1 - Evolution of the Profile of PPGEM Entrants		
1. E-mail:* (E-mail, required)		
2. Full name: (Short Answer Text)		
3. Gender: (Multiple choice)		
a. Feminine	c. I prefer not to declare	
b. Masculine	d. Others (specify with text)	
Section 2 - Graduation Data		
4. What is your undergraduate education? (short answer text)		
5. At which educational institution did you complete your degree? (short answer text)		
6. What is the year of graduation? (short answer text)		
7. Did you participate in Scientific Initiation/Teaching/Extension Projects during your undergraduate studies? (Multiple choice)		
a. Yes	b. Not	
8. Did you have any articles published during your undergraduate studies? (Multiple choice)		
a. Yes	b. Not	
9. Before joining PPGEM, did you have another postgraduate course? Which? (Example: Professional Specialization in Occupational Safety, Geotechnics, MBA's, etc.) (short answer text)		
Section 3 - About Admission to PPGEM		
10. What is your motivation/objective when starting the Master's or Doctorate course at PPGEM? (Multiple choice)		
a. Pursue academic life	d. Lack of opportunities in the market	
b. Professional Improvement	e. Project of the company where I work (worked) in the mining area	
c. Personal Motivation	f. Others	
11. Write in your own words your motivation for joining the PPGEM (Masters/Doctorate) (short answer text)		
12. Which course did you join PPGEM? (short answer text)		
13. What was the selection process like for admission to the course? (short answer text)		
14. Did you complete your course at PPGEM? (Multiple choice)		
a. Yes	b. Not	
Section 4 - What is the reason for your withdrawal?		
15. (short answer text)		
Section 5 - The next questions will be related to your PPGEM course		
16. Choose which option suits you best: (Multiple choice)		
a. Master's degree	b. Doctorate degree	c. Master's and Doctorate
Section 6 - For those who are currently studying or have already completed one of the PPGEM courses (master's or doctorate)		
17. Date of entry into the PPGEM course (year and semester) (short answer text)		
18. Concentration Area (Multiple choice)		
a. Lavra de Minas	b.Ore Treatment	c. Mineral Economy
19. When joining PPGEM, did you have any employment relationship? (Multiple choice)		
a. Yes, I work/worked for a private sector company	d. No, I was/am a scholarship holder	
b. Yes, I work/worked in a public sector company	e. Others	
c. Yes, educational institutions		
20. If you have already completed your master's/doctorate at PPGEM, in which sector do you currently work? (Multiple choice)		
a. Public	b. Private	c. I do not carry out professional activity
21. What activity do you currently carry out? (Multiple choice)		
a. Management Position	e. Researcher at Research Institutions	
b. Technical area	f. Student (still in course)	

c. Consultancy		g. Others
d. Teaching		
Section 7 - For those who took the master's and doctorate courses		
22. Date of entry into the master's course (year and semester) (short answer text)		
23. Date of entry into the doctoral course (year and semester) (short answer text)		
24. Concentration Area (Multiple choice)		
a. Lavra de Minas	b.Ore Treatment	c. Mineral Economy
25. When joining PPGEM, did you have any employment relationship? (Multiple choice)		
a. Yes, I work/worked for a private sector company		d. No, I was/am a scholarship holder
b. Yes, I work/worked in a public sector company		e. Others
c. Yes, educational institutions		
26. If you have already completed your doctorate, in which sector do you currently work? (Multiple choice)		
a. Public	b. Private	c. I do not carry out professional activity
27. What activity do you currently carry out? (Multiple choice)		
a. Management Position		e. Researcher at Research Institutions
b. Technical area		f. Student (still in course)
c. Consultancy		g. Others
d. Teaching		

Table 1: Questionnaire directed to respondents

current moment, seeks to integrate the areas.

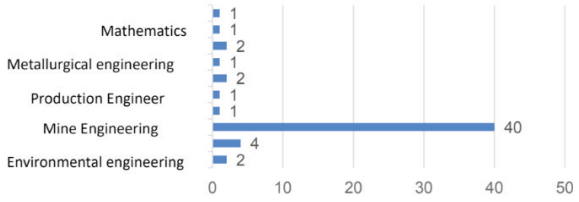


Figure 2 – Professional profile of PPGEM – UFOP students.

Another important topic covered in the questionnaire refers to participation in Scientific Initiation/Teaching/Extension Projects and publication of scientific articles during graduation. It is noted that, despite 67% of those interviewed claiming participations in projects throughout their undergraduate studies, 50% actually published a scientific article (Figure 3A and 3B). The most recent PPGEM notices (from 2017 onwards) benefit and score applicants taking into consideration, scientific production and participation in projects for the candidate's classification (an example is PPGEM NOTICE No. 005/2017). Thus, it was found that the research participants were already considering taking a postgraduate course and/or were interested in the research area. Despite this, approximately ⅓ of the people who participated in one of the projects mentioned did not have their work published, illustrated in Figures 3-A and 3-B.

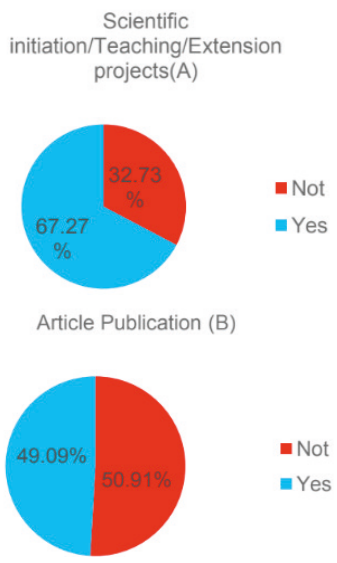


Figure 3 - List of PPGEM - UFOP students. A - About participation in scientific initiation/ teaching/extension projects; B- Scientific production.

Still regarding the professional profile of the interviewees, it was observed that 31 people (56.3%) did not have another previous postgraduate degree, which means that a master's degree was the first option to continue studies after graduation. Among the others, around 22% had specialization, according to data presented in Figure 4.

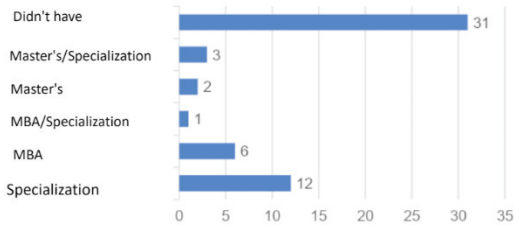


Figure 4 - List of PPGEM - UFOP students regarding previous training.

It was also possible to note that among people who did not take any specialization course, the average time between graduation and entry into the PPGEM was 1.68 years and that professionals looking for specialization courses take a little longer, around 7.44 years (Figure 5). This longer average time between graduation and entry into the master's course linked to the number of entrants over the years, is directly related to economic factors, as shown in research carried out by Figueiredo et al. (2020). Economic crises are factors that influence the demand for courses for qualification and professional development while the mining sector is slow and few job opportunities are available.

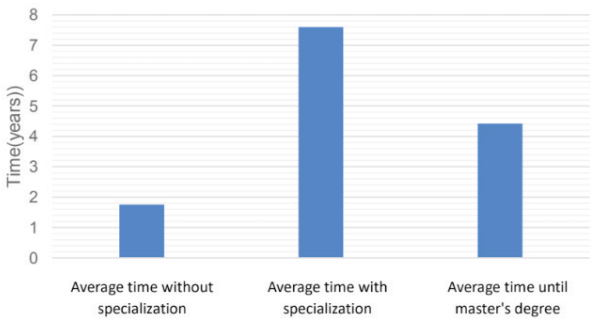


Figure 5 - Average time between the last academic training and entry into the PPGEM - UFOP.

When referring to the motivation for which the research member sought the PPGEM, the answer "Professional Improvement" predominates (74%). Secondly, approximately half of those interviewed selected the option "Follow academic life". Thoroughly analyzing the participants' degrees together with the data obtained and presented in Figure 6, it is noted that 13 of the 14 interviewees who do not have a degree in Mining Engineering chose the alternative "Professional Improvement" (A.E.) or "Project of the company where I work (worked) in the mining area" (P.E.), indicating the interest of professionals from other areas who already work or intend to work in the mineral sector and seek qualifications in the area. When there was space for discursive answers (question 11), this fact was reinforced by the following answers: "The current mineral scenario offers great opportunities" and "Opportunity to enrich knowledge and assist in entering the job market".

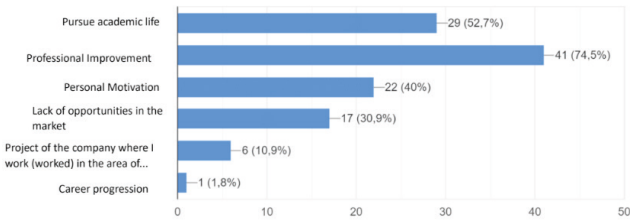


Figure 6 - Reason why interviewees were motivated to join PPGEM - UFOP.

None of the interviewees dropped out of the course they entered, that is, all the graduates interviewed completed the course.

When asked about the areas of concentration, it is noted that in the master's degree there is parity regarding the distribution of interviewees between the areas of Ore Treatment and Mining, which does not occur for the doctorate: there is a higher percentage of interviewees in the mineral treatment area (Figure 7). The number of interviewees referring to the master's degree was significantly higher than

the doctorate, given that the second began its activities in 2015; therefore, the number of doctoral students is actually lower than the number of master's students. The graph presented in Figure 7 totals 55 interviewees, as 10 completed their master's and doctorate degrees at PPGEM.

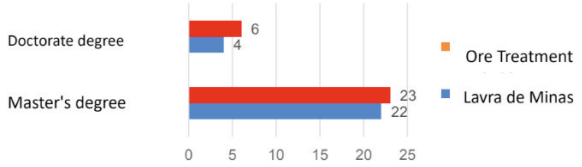


Figure 7 - Distribution of interviewees between master's and doctoral courses and concentration areas: Mineral Treatment and Mine Mining at PPGEM - UFOP.

With the questionnaire it was possible to note that of the people who only studied the master's degree at PPGEM, approximately 54% were scholarship holders. This fact goes back to the analysis by Pereira et. al. (2022) that although PPGEM-UFOP is focused on the development of research and academic production, there is not a search exclusively for scholarship students with exclusive dedication, but also for professionals with some type of employment relationship who are interested in improving technical knowledge. For the doctorate course, the number of scholarship holders decreases, and these professionals, because they already have a higher level of training, are now able to find places in the job market (Figures 8-A, 8-B and 8-C).

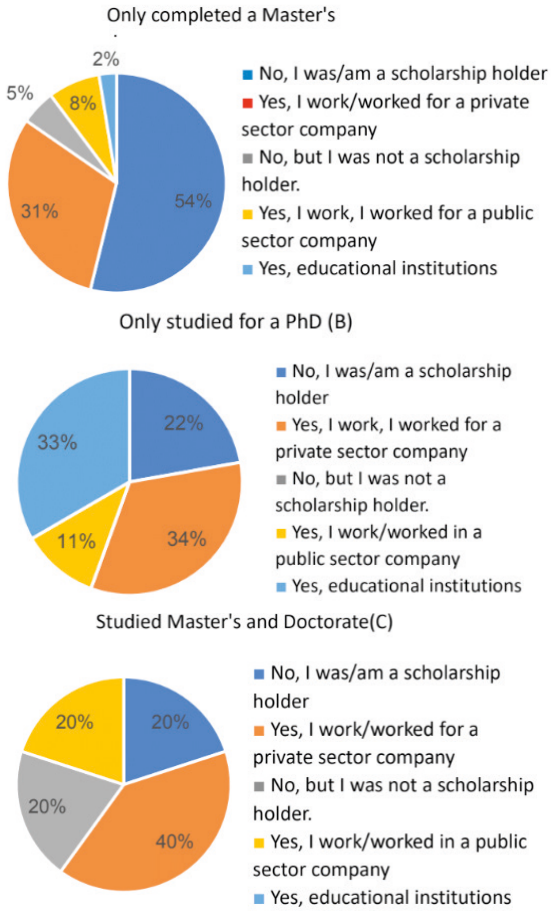


Figure 8 - Distribution of interviewees regarding source of income among students on PPGEM - UFOP courses: A - Master's degree; B - Doctorate; C - Master's and Doctorate.

Based on information regarding the employment status of those interviewed when joining PPGEM, around 53.5% are or were scholarship holders, followed by 25.6% who work or have worked in private sector companies. Regarding professional activity, it is noted that more than half (55.88%) work in the private sector and, more specifically, 44.19% work in the technical area. As shown in figures 9-A, 9-B and 9-C.

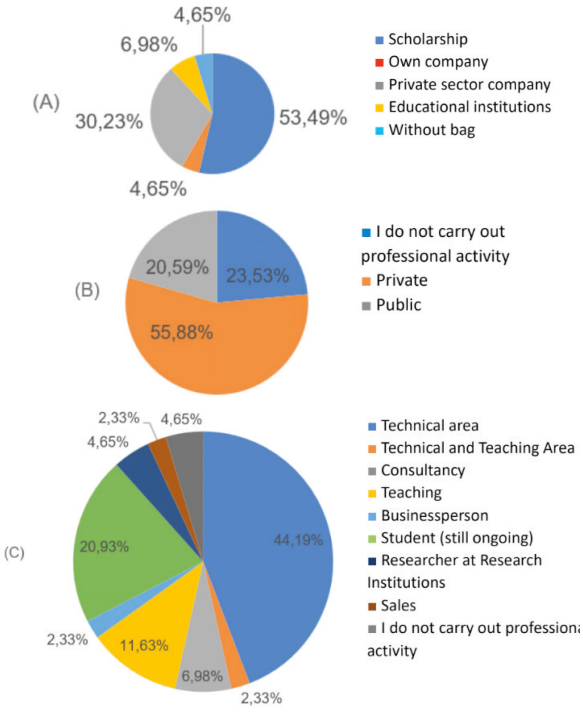
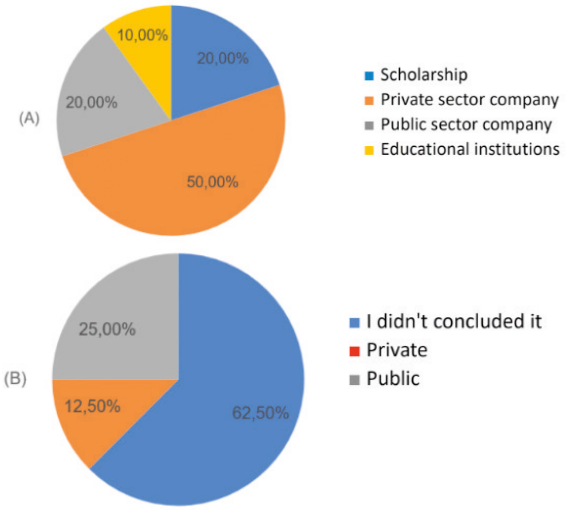


Figure 9 - Distribution of interviewees regarding employment status: A - upon entering the course; B- upon completing the course; C - currently.

Referring to the 10 people who completed both their master's and doctorate degrees at PPGEM, it is observed that 40% when joining PPGEM worked in private sector companies; In the current scenario, 50% work in teaching (Figure 10A, B and C).



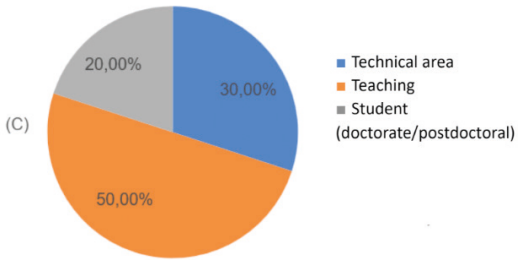


Figure 10 - Distribution of interviewees who completed a master's and doctorate degree regarding employment: A - upon entering the course; B- upon completing the doctorate; C - if you complete your doctorate, what is your current work sector?.

CONCLUSIONS

The mining-metallurgical sector is rich in areas of professional activity, from mineral research and characterization, mining and processing studies and planning, waste and tailings management, control of environmental impacts, mine closure and stability controls; and multidisciplinary nature in the sector covers several areas of knowledge. The demand for PPGEM courses, despite being mostly by mining engineers (73.58% of questionnaires answered), is also the target of interest from professionals from other areas.

Although adherence to the report was relatively low when compared to the total number of graduates since the beginning of the program, trends and similarities were observed regarding the responses of those interviewed.

From the research carried out, it is concluded that PPGEM courses are strongly sought after by professionals from areas other than mining as a way of qualifying in the area due to the prosperity or opportunities in the sector, this being one of the profiles of professionals who seek the program.

Likewise, in search of better qualifications for the job market, it was observed that mining engineers who pursue the program are not

necessarily focused on pursuing an academic life, with the appreciation of PPGEM by professionals who work in the business world being notable. There was also a tendency for former students of the institution (UFOP) to choose the program to continue their studies.

Approximately ⅓ of respondents (30.9%) chose the option "Lack of opportunities in the Market" when asked about their motivation for joining the program, indicating the recession observed in recent years in the job market.

Approximately ¼ of the participants worked in private sector companies during the course period and more than half currently work in teaching. Therefore, it is concluded that the master's degree and doctorate, even considered academic, are well regarded as postgraduate courses and valid for career development in the business world. Analyzing people who completed both a master's degree and a doctorate, the same pattern is observed, with a considerable number of interviewees in the business world, in addition to what is expected from participants who work in teaching or research. Thus, it can be concluded that the industry is looking for professionals qualified in research.

With the results obtained, it is possible to conclude that the opportunities offered by the mining sector are attractive when analyzing professionals who seek PPGEM courses. In the same way, PPGEM courses are recognized by most of the people interviewed as "high quality" courses, emerging in a region of intense mining activity. Therefore, there is a break in the taboo that people seek a master's degree and doctorate just with the intention of continuing in academia, noting the appreciation of professionals who complete a Postgraduate Degree in Mineral Engineering in the job market.

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