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MATHEMATICAL RECOGNITION

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Abstract

In my PhD I am looking at how is operated the recognition that constitutes the 'individual' while 'working mathematician'. Seven working mathematicians were interviewed who belong to the Brazilian and the Sao Paulo Academies of Science, as the professional life of these working mathematicians carry also prestige which make them mathematicians above any suspicion.

Introduction

The mathematical production has its delimited contours and it has been produced within specific communities. In this sense, a working mathematician comes to be recognised or classified as such within a determined order by discipline [1] which supposes an examination [2].

My question addresses working mathematicians above any suspicion; they obtained the recognition of the mathematical community. Of course, I searched their names in the catalogues of Academies of Science, the Brazilian and the Sao Paulo one. I interviewed seven working mathematicians through the lens of competence [3] and conduct [4] judgement process.

Constitution of Prestige: Mathematical Recognition

Wenger (1998) considers that: "...practice is the source of coherence of community (...) is built upon mutual engagement, join enterprise and shared repertoire"(pp. 72-73). Burton (1999), on this base, shows that collaborative research and mutual engagement are fundamental aspects of mathematician's practices. I argue by adding aspects of 'professional mathematicians' to it.

However, it is necessary to remember that mutual engagement can be thought, for instance, as a constant struggle (of class) in the sense of Althusser (1970). The institutions are seen as ideological apparatus of the State, therefore the practices exercised are in balance with the Ideology of the State.

Based on Wenger (1991), Burton (1999) states that:

> A community of practice is a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretative support necessary for making sense of its

> heritage. Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. (ibid., p.123)

Considering this definition is not possible to identify the differences that exist amongst the general kind of practices (or articulations), i.e. what potential criterions that make possible a differentiation from one practice to another? When Burton (1999), quoted from Wenger, states that community of practice "...is a set of relations among persons, activity, and world" (p.123), no matter what relation can be found (considering the 'human activity') always it will be part of communities of practices. In this case, it is possible to identify the communities with anything possible to be thought.

For Althusser (1970) "...each social practice is the work of production which brings together raw materials, men and means of production - not the men who perform the work, who cannot therefore claim to be the subjects of the historical process." (*ibid.*, p. 316). The practices that are exercised in the research centres (ideological apparatus) are agreed with a juridical and an administrative system that are operated by bureaucracy. The principle of salary, hierarchy and contract is exercised in the factories or in the universities.

Burton (1999), considering Wenger's work about communities of practices, proposes to answer how the mathematicians come to know mathematics. She developed an epistemological model based on critical literature of the area consistent with an investigation done in general institutions. She interviewed 70 mathematicians (35 women and 35 men). In Burton's epistemological model there are five components which describe knowing in mathematics: its person- and cultural/social-relatedness; the aesthetics of mathematical thinking invoked; intuition; styles of thinking; and connectivities (Burton,1999, p. 36). In fact, this result is linked to one specific kind of community of practices, that is, the mathematical community of practices. The practices exercised in this community are exercised in the ambit of the professional mathematics ('institutionalised'). The mathematical production seeks to become merchandise, that is, the mathematicians who work for producing mathematics get a salary for it and prove their performances through reports. Burton's empirical base consists of interviews with working mathematicians meaning that the analysed practices are within the institutional field.

With respect to Burton's work, I am particularly interested in this specific community as I am interested in the distribution of mathematicians upon hierarchy [5] that supports the career of such professionals. Certainly, we can find them in the described condition, either in Brazil or abroad. Burton (1999) calls 'employment status' to the possible career positions upon such distribution:

	Postdoc	Lecturer	Senior Lecturer	Reader	Professor	Senior Res. Officer	Research Fellow
Females	1	19	7	3	3	1	1
Males	1	17	9	2	6		

Burton (1999, p. 125) shows that the mathematicians classify themselves in specific areas like statistics, applied mathematics or pure mathematics, as it shows the table below:

	Pure Mathematics	Applied Mathematics	Statistics
Female	17	10	8
Male	15	13	7

Naturally, I found *enunciations* [6] of this kind in my interviews: *I am a pure mathematician and I have been working with Theory of Singularities.* (Loibel, mathematician) or *...my research area is Transformation Group Theory, defined by Differential Systems.* (Alexandre, mathematician) or *...at the moment I am working with things linked to Logic and Fundaments.* (Chaim, mathematician).

The fact of belonging to a mathematical community of practices means to be different of the rest who doesn't belong to it. This means the articulation of specific *knowledges* like Topology, Algebra, Singularities Theory and so forth. This means to assume a position in the career; it means to participate in conflicts:

...conflits are frequents in the university environment, but many times they are exacerbated or accentuated by the difference of people's formation... you see, my training, my long stay abroad (USA), my contact with mathematicians (...) it gave me an experience of mathematics which is not always adjusted to the Brazilian reality, originating conflicts. (Alexandre, mathematician)

To participate in this specific community of practices, it is necessary to submit the *surveillance*, so that the judgement becomes possible. There is a need of mathematicians capable to judge students or the shift in their careers. In this sense we found another knowledge which a professional mathematician articulates: to know how to judge.

In the process of recognition there is the constitution of prestige (Baudrillard, 1981) upon the new members who are starting their careers. Here, it is worth to point out that one does not judge only the articulation of the mathematical knowledge (competence), but also the conduct, i.e. it is necessary to take into account the possibility of adaptation of the individual to the discipline established by the research and teaching institutions.

It is through *surveillance* that one produces the expected conduct and competence. *Surveillance* needs to be seen by individuals who are exposed to its permanently; it must impregnate who is watched in a such a way that he/she acquires from himself/herself the vision from who is looking at. (Foucault, 1984). It is one perpetuate, continue work of rewarding (to constitute prestige) or to punish, to lower.

In the reports about some of the interviewees' undergraduation courses, I pointed out the exercise of *disciplinary power*, exercised through *surveillance*. The interviews describe the rigidity of the Mathematics Course of F.F.C.L.[7] Around 30 students began the course, however, two or three had finished it:

...If you were not able to read three or four languages you would not survive, as many colleagues didn't, that is, we were in thirty and only two were left. (...) We started with Prof. Elza Gomide, very rigorous teacher, beginning directly with Analysis. (...) From the first days of undergraduation, we had to have a discipline of very mathematical rigorous. (...) At the end of the year, you had the oral exam, where the teacher demanded the discipline's knowledge of the whole year. (...) We had to know the demonstration of all the theorems that were worked during the year, of a determined discipline (...) until nowadays... my demonstration technique... I learned it there... I have no doubts about it. (Loibel, mathematician)

In this report Loibel didn't only speak about the formal exams, but also of the permanent demand of tasks and necessary competencies for the survival in the undergraduation course. Tasks that absorbed good part of the individuals' time, the ones who desired to become mathematicians. Alexandre and Ubiratan state the same about the Mathematics Course of F.F.C.L.:

When I was finishing my undergraduation, Cândido (a lecture), who was the representative of Sao Paulo at the National Council of Researches, asked me if I would like to have a fellowship to do a PhD abroad. I accepted it and he proposed my name to CNPq and I got the fellowship. Furquim (a lecture) invited Weil to be my supervisor. Then I went to Chicago to work with Andre Weil.(Alexandre, mathematician)

In fact, Alexandre got the fellowship because he had already built his reputation. Both lectures, Cândido and Furquim, had a judgement regarding to Alexandre. Such judgement was constituted, through the *surveillance*, during his four years of undergraduation course.

When Alexandre came back from USA, his colleagues saw him with respect (prestige), as Ubiratan (mathematician) says in one of the interviews: *You were at the first Colloquy, I remember your course very well, you arrived like that: first PhD... of Philosophy (F.F.C.L.).*

To participate of the Brazilian Colloquies of Mathematics was meant, for many of these mathematicians, a stage; a place to performance as they did through courses that many of them ministered on those occasions:*...the course I gave had a big impact. I had Mauricio Peixoto's honour to attend all the classes, (...) until nowadays he says good things about me because of that course.* (Loibel, mathematician)

The colloquies had a very important role, an attitude, that was taken from the beginning, was the effort of gathering texts which helped to form a Brazilian literature of Mathematics. For example, two of the courses I gave, of the three

courses or four courses in the Brazilian Colloquy, two of the courses (...) they were transformed..., in a book on Analysis and another one on Applied Differentiates Equations. (Djairo, mathematician)

The first meetings of the country: the Brazilian Colloquy of Mathematics I found it; the Brazilian Seminar of Mathematics I found it. Later others found the Algebra Seminar and other things and the business started. (Chaim, mathematician)

Conclusion

The working mathematicians in question work and had worked in the formation and coordenation of Mathematical Colloquies, Seminars as well as being members of institutions that judges projects, posts, publications and so forth. They supervise and supervised research projects, i.e. they act in the reproduction of labour force of professional mathematicians.

To exist as mathematician within an academic community implies to deal with different areas of competence. There exists then production of knowledge across specifics practices. Such pratices demarcate networks of *knowledge-power* and produces an individual as mathematician.

Recognition is the constitution of prestige (Baudrillard, 1972) offered by the ones who are in the position of 'who is looking at', i.e. it is through permanent *surveillance* that one seeks to judge, to classify. The disciplinary power institutionalises the seek of truth; it profissionalises; it recompenses you. (Foucault, 1977)

Notes

[1] These methods, which made possible the meticulous control of the operations of the body, which assured the constant subjection of its forces and imposed upon them a relation of docility-utility, might be called 'discipline'. (Foucault, 1977)

[2] The examination combines the techniques of an observing hierarchy and those of a normalizing judgement. (Foucault, 1977, p.137)

[3] "A peaceful conflict is 'competition' insofar as it consists in formally peaceful attempt to attain control over opportunities and advantages which are also desire by others." (p.38) Weber, M.:1968, *Economy and Society: and outline of Interpretative Sociology.* (Trans.). Berkeley, Los Angeles and London: University of California.

[4] By 'conduct' I understand the real behaviour of people with respect to the code that determines what acts are permitted or unauthorised.

[5] The differentiation principle as code of usefulness (Baudrillard,1981).

[6] Vallejo, A. and Magalhaes, L.C.: 1991, *Lacan: operadores de leitura*. 2.ed. Sao Paulo: Editora Perspectiva.

[7] F.F.C.L. (Faculdade de Filosofia Ciencias e Letras) is an Institution of Research and Teaching. It was found at the same time of the State University of Sao Paulo, in 1934. The Mathematics course, as well as the Physics and Sociology, were part of the F.F.C.L..

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