A PROFILE OF TEACHER QUALITY AND STUDENT PERFORMANCE IN BRAZIL’S BASIC EDUCATION


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Abstract

According to the Pesquisa Nacional por Amostras de Domicílios (PNAD) from 1992 to 2009, the enrollment rate of young people aged 15 to 17 rose from 59.7% to 85.2%. That is, the period of Brazilian population growth, together with its social development, has led to the growth of the school population. These increasing values only identify the need and importance of a more pronounced look at teachers. With the increasing attendance of students in schools, the role of teachers becomes increasingly complex, with more heads to manage and pass on their teachings. It has become necessary to expand the teaching staff to be able to serve the entire school population. Even more important than the expansion of the teaching staff, their qualification and qualification should also be expanded, since in the not so distant future, the fall in birth rates will decrease the population of school-age youth in Brazil. Thus, the high number of teachers will not be more relevant, but their qualities and professional skills. By saying that, this work is aimed specifically at teachers working in the basic education in Brazil and their personal, professional and academic characteristics, and how these characteristics affect the performance of their students. Thus, the main objective of this work is to determine the quality profile of 3rd year public high school teachers, and what is the relation of these profiles and their student’s academic performances. The data used were made available through the microdata of Prova Brasil 2013 (SAEB), carried out by INEP. The Grade of Membership (GoM) method was used to construct the pertinence profiles of teachers according to their characteristics. In the possession of these profiles, it was verified which teacher’s characteristics resulted in an effective way in good performances of their students in the evaluated curricular component. The results indicate three groups of teachers with different characteristics: a group considered the to be the one with higher quality, another one classified as medium quality, and the last one classified as poor-quality profile. For each group outlined, the performance of their students was distinct, presenting higher performance those students associated with high quality teachers, and lower performance students with poor quality teachers.

Keywords: Teachers quality, Basic Education, Grade of membership.

1 INTRODUCTION

Currently, in Brazil, the population between 7 and 14 years of age attends elementary education and the population proportion of 15 to 17 years attending school has increased over the years. However, the universalization of basic education is not limited to the expansion of places and the number of children and young people inserted in school environments [10]. The expansion of the vacancies should be accompanied by an increase in the quality of teaching, in order to establish goals that aim at the permanence, evaluation and learning conditions of the students, in conjunction with the physical and pedagogical infrastructure of the schools [19].

Based on researches that work in the field of the demography of the education [1] [5] [15]. Our main object of problematization is quality education. We sought to investigate the relationship between the quality of teachers working in the basic education system in Brazil and the students’ performance. From that perspective, we made a methodological delimitation by analyzing mathematics teachers and the proficiency score obtained by the students in this discipline. The reason for this choice is because research shows that the influence of teacher quality on student performance is greater in mathematics than in languages [8]. This is because most students in the basic education network have contact with mathematical issues only when they are in the classroom, while language learning and/or other sciences are more easily experienced in out-of-school environments. That is, mathematics has a typical school character, while knowledge of language occurs in different social environments frequented by the student [2] [8] [13].
In this sense, the purpose of this study is to determine the quality profile of the teachers of the mathematics discipline of the 3rd year of high school, who teach in the state public network in Brazil, and what is the relation of these profiles to the students' school performance.

As a method to explore the relationship between teaching quality and school performance, the Grade of Membership (GoM) was applied, which enabled the creation of a typological model, creating profiles that encompass dozens of variables, in several dimensions related to teachers, many of them never used in the literature with the objective of determining the teaching quality and its association with the student's academic performance.

1.1 Quality of education: reflections on the Brazilian context

The design of dimensions, factors, and indicators of quality of education is gaining more space for studies and important reflections on the agenda of governments, social movements, parents, students and researchers in the field of education. From this perspective, it is emphasized that the implementation of a quality school presents itself as a complex and great challenge. In the last decades, in Brazil, advances were made in terms of access and coverage, especially in elementary education. This process needs several improvements in relation to effective learning.

Education is one of the social pillars responsible for the development of a society. The way in which school education is directed at the population has great consequences for society. A population with good quality education tends to support itself with a just, supportive and democratic basis. But what gives a good quality education? Quality education is one that generates positive results for the well-being life of society, from the school community [9].

The quality of education is a complex, comprehensive phenomenon that involves multiple dimensions, whether in and/or extra-school [7]. Education is a social instrument sustained by several factors that act in the long term aiming at the transformation and the human suitability for harmonious living in a more just and egalitarian environment. It can be considered of good quality when it "shapes people to think and act with autonomy" and this must start from preschool and last the life of each individual [9].

The United Nations Educational, Scientific and Cultural Organization (UNESCO) uses the relationship between material and human resources to determine the quality of education. That is, the relationships existing in the classroom present in the teaching-learning process, the curriculum, the students' learning expectations defined by the educational outcomes can represent the students' school performance [21].

In Brazil, the Law of Guidelines and Bases of National Education [3] is in force, the main legislation that guides the country's educational system. It has undergone several modifications over the years to meet social, cultural, political and economic demands. Given this, it is known that there are several limitations and failures in the execution of the text that is present in the legislation. And for this law to be fully implemented, a set of factors must be improved, especially the human factor. For there is little availability of personnel with the characteristics required by law and this makes it impossible to comply effectively. The National Institute of Educational Studies and Research Anísio Teixeira (INEP) confirms this scenario of staff shortage when it exposes data from the School Census [16].

We can not reflect on quality in education without problematizing the role of the teacher and the various elements related to his professional performance. Some questions are more latent, such as the lack of investment and appreciation of the professional educator in Brazil when we observe the average salary of this labor class, which is too low in relation to its importance for society. In addition to the salary issue, teacher qualification is essential for the good performance of students, since a higher qualification and experience of this professional are elements that reflect positively on the success of the students [20].

1.2 Teacher qualification and school performance

Regarding the quality of teachers, how to define whether a teacher is very or poorly qualified to perform his or her function? In general, the degree of quality is defined as the academic degree of each teacher. In studies where comparisons of the quality of teachers with the scholastic performance of the students are carried out, the academic degree of the teacher is mostly used as a quality criterion. However, several other factors, including some difficult to measure such as motivation, enthusiasm, and ability to teach, are of fundamental importance in defining a good quality teacher or not.
The literature presents some works trying to make the confrontation between the teacher quality profile and its influence on the students’ school performance at different levels. One example is preschool work, which addressed this comparison using variables other than the academic qualifications of teachers [6]. In this study, the authors selected variables according to three dimensions of teaching: enthusiasm/responsiveness, control/discipline, and academic level.

Other studies compare the teacher’s qualification by the students’ results in the Portuguese and Mathematics subjects. For example, the variables "teacher qualification", "student age" and "years of teaching experience" are the most important when confronted with student performance in the Language and Mathematics disciplines [17].

2 METHODOLOGY

2.1 Data source

We used data collected from the Basic Education Assessment System (Sistema de Avaliação da Educação Básica - SAEB), resulting from periodic surveys that present diagnoses referring to the evolution of the Brazilian educational framework. Two assumptions are used by this system to carry out the evaluative diagnoses: 1) the students’ performance reflects the quality of the teaching given; 2) no isolated factor determines the quality of teaching [12].

The databases constructed by SAEB cover student performance information regarding students from three levels of school (5th and 9th years of Elementary School and 3rd grade of High School). Students at these school levels respond to specific assessments of Portuguese (reading) and Mathematics (solving numerical problems) and a grade is assigned to everyone according to their answers. The assessments that make up the SAEB are National Assessment of Basic Education (Avaliação Nacional da Educação Básica - Aneb) and the National Assessment of School Performance (Avaliação Nacional do Rendimento Escolar - Anresc or Prova Brasil). In addition to this student proficiency information, SAEB exposes information about student groups and schools, as well as contextual issues about students, principals, and faculty.

The basis for the development of this research we present was the project “O habitus de estudar: construtor de uma nova realidade na educação básica da Região Metropolitana de Natal”, funded by the Observatório da Educação Program, Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES). Thus, this study covers teachers from all over Brazil and the reference year of the data is 2013, the most current version of SAEB until the moment of this research.

The data were filtered from the selection of the teachers of the Mathematics discipline who work in the 3rd grade of the Public Schools of state dependency. In total, Saeb collected information from 1,729 teachers with these characteristics. But we eliminated the incomplete data that harmed the study. We discarded the teachers with questionnaires that had missing values in some of the variables used. With this filtering, we reached a total of 1,305 teachers with the mentioned characteristics.

2.2 Variables

The variables used included these characteristics: (i) personal and cultural (reading of books, newspapers and magazines, attendance at libraries, theater shows, museums, musical concerts); ii) teacher qualification (schooling, higher education institution, postgraduate area, years of teaching work); iii) improvement (participation in courses, workshops, teaching methodologies, specialization, management of the organization in the classroom, improvement in the use of classroom technology); iv) teaching practice (time dedicated to extracurricular activities, use of information and communication technologies, home activities, thematic projects for teamwork); v) school issues (class council meeting, participation in the creation of the school curriculum, discussion about student learning); vi) professionals (salary, assignment in other activity, number of schools in which they work, weekly worked hours). These variables, in all dimensions, are grouped into a single database that was submitted to the GoM method in a unique way.

2.3 Grade of Membership Method

For the creation of a typology referring to teaching quality, we use the Grade of Membership (GoM) method. The method of categorical data modeling allows the grouping of individuals using the logic of
the fuzzy sets [4]. This method classifies individuals in the data set into different profiles or membership groups. The Grade of Membership method uses a statistical estimation of maximum likelihood and authorizes the exclusive presence of discrete or continuous variables categorized to be possible its application.

Diffuse logic is based on the post-analysis assignment of a degree of membership (or degree of belonging, or GoM score) for each element relating to each generated extreme profile. This degree of pertinence is denoted by \( g_{ik} \) and its values vary in the interval \((0,1)\). An element with membership degree 0 (zero) does not belong to the reference profile \( K \), whereas the degree of membership 1 (one) indicates that the element has all the characteristics of the \( k \)-th profile [18]. To the extent that an element has a high degree of belonging to an extreme profile, it is more distant from the other profiles. There is also the possibility that the individual belongs partially to more than one profile, then mixed profiles are created.

The calculation process is iterative and incremental. The main advantage of the GoM characterization is that no assumption about the distribution of variables \((Y_{ij})\) is required. This is because the membership parameters \((g_{ik})\) are not considered as following a distribution and the probability parameters \((\lambda_{kj})\) are estimated simultaneously to them. In this way, the distribution of the elements of analysis is absorbed in the estimation of \( g_{ik} \) without contaminating or influencing the \( \lambda_{kj} \) [18].

3 RESULTS

The present study offers a descriptive analysis that uses variables related to personal and cultural characteristics, professional, qualification and teaching practice. We emphasize that the application of the GoM method allowed the design of three extreme profiles, which made it possible to determine the association between teacher quality and student performance.

3.1 Performance of students according to the profiles

Some statistical analyses were performed to verify students' performance in each teacher quality profile (Figure 1).

![Figure 1. Student performance in mathematics, by teaching quality profile, Brazil – 2013 (Source: Authors’ elaboration, according to SAEB/INSP data).](image)

In Figure 1, we observed that the averages of the teachers' classes belonging to the high-quality profile and their mixed ones are the highest among all the profiles, except for the average + high-quality mixed profile, which surpassed all other profiles in relation to the mean.
To understand the variability of student performance in each profile, we present Figure 2.

Figure 2. Box-Plot distribution of student performance in Mathematics, by teaching quality profile, Brazil - 2013 (Source: Authors’ elaboration, according to SAEB/INEP data).

Among the extreme profiles, Figure 2 shows that the profile that shows the lowest variability in the data is the poor-quality profile. While the profile with greater variability is the profile of high-quality. In addition to the variability of performance between the profiles, Figure 2 also shows the discrepant points (outliers) that are present in each profile generated.

In this study, we included a statistical analysis of variance (ANOVA) and multiple comparison tests for a more in-depth examination of student performance among teacher quality profiles. This allowed the visualization of statistical differences between the averages of performance per generated profile.

We clarify that prior to the application of ANOVA, a test to verify the homogeneity of the profile variance was also performed. The Levene statistical test, which rejected the hypothesis of homogeneity among the variances of the profiles with 5% of significance. That is, at least two of the generated profiles have statistically different variance [14].

At the significance level of 5%, the ANOVA indicated the rejection of the null hypothesis of statistical equality between the means of the profiles. The next step was the multiple comparison test. The test chosen was Tamhane’s T2, which considers the variance heterogeneity [11].

The results of the Tamhane T2 test indicate that the performance of the classes with high-quality proficient teachers differs statistically from most of the generated profiles, except for the medium + high quality mixed profile and the mixed profiles derived from the high-quality profile itself.

The average quality profile differs statistically about the performance of the students, only the average + high-quality mixed profile and the high-quality extreme profile.

Finally, the performance of the teachers’ students in the poor-quality profile shows a significant difference between the mixed profile of average + high quality and the mixed profile of high-quality + average, as well as the extreme profile of high-quality (Table 1).
Table 1. Differences between averages and p-value, by student performance in Mathematics, according to the profile of teaching quality, Brazil - 2013.

<table>
<thead>
<tr>
<th>Profiles</th>
<th>Difference between means (I-J)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I)</td>
<td>(J)</td>
<td></td>
</tr>
<tr>
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<tr>
<td>Average + High</td>
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<tr>
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<td>Average quality</td>
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<td>Low + High</td>
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<td>High + Average</td>
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* The difference between means is significant at the 5% level.

4 CONCLUSIONS

The application of the GoM and its dimensions of quality resulted in the creation of a typology of the teaching public that delineates three extreme profiles, according to the student performance in the Prova Brasil, an indicator of the quality of teaching. That is, the distinction between levels of student performance made it possible to determine a classification order of the teaching profile as low-quality, average quality, and high-quality.

- Low-quality teacher profile: teacher who does not have the habit of reading and/or attending libraries; lack of teaching experience; never participates in courses or workshops of teaching methodologies and, if it participates, has not learned significantly; considers it necessary to improve methodological aspects; devotes few hours of extra hours to extracurricular activities, does not develop team projects, does not use information and communication technologies in class, and rarely corrects homework assignments; almost no dialogue with other teachers; meets up to 80% of content scheduled for a school year; believes that few of his students will reach higher education; three different schools.

- High-quality teacher profile: teacher with a habit of reading frequently; holds a doctorate degree and extensive experience in the classroom; has taken courses, specializations and knows multiple teaching methodologies; uses information and communication technologies in the classroom, devotes part of the workload to extracurricular activities, corrects homework and stimulates the students' critical thinking; maintains constant dialogue with other teachers; fulfills
more than 80% of content scheduled for a school year; believes that more than half of its students will achieve higher education; teaches in a single school.

- Average quality teaching profile exposes intermediate characteristics between the previous profiles.

We emphasize that the student performance in the SAEB 2013 test was used as an indicator of teacher quality. The analysis of this performance in conjunction with the generated profiles indicated an increasing behavior of student performance between the extreme and mixed profiles generated, in which the extreme profile of low-quality presented the lowest mean in student performance, followed by the mixed profile of low-quality + average, low + high-quality, and so on. The only profile that presented behavior different from the logical order was the mixed profile of average + high-quality, which presented the highest student performance average in proficiency, higher than the extreme profile of high-quality.

We also note a logical association between the students’ performance and the characteristics of the teachers in each profile. However, we emphasize that the full weight of education should not be attributed exclusively to teachers. For, quality education is obtained from a set of intraschool and extracurricular factors. Therefore, it involves teachers, employees, parents, and community.

REFERENCES


