

Teacher collaboration and educational outcomes in Brazil¹

Colaboração docente e resultados educacionais no Brasil

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ABSTRACT

This article started with an inquiry about the extent to which collective teaching work produces different educational results. Thus, its objective was to verify whether teacher collaboration has an impact on students' outcomes and to investigate the various school factors associated with increased teacher collaboration. In this exploratory quantitative study, data from the Prova Brasil of 2017 was used for the fifth grade of municipal and state schools from all over the country. From the answers of the contextual questionnaires, indicators were created and used in linear regressions that estimated the relationship between student proficiency and teacher collaboration, as well as the relationship between the latter and teachers' perceptions of other school factors. The results indicate that greater collaboration among teachers has positive impacts on students' proficiency and that school factors such as a principal's leadership, the number of schools where a teacher works, and the perception of students' aggressiveness are associated with greater or lesser collaboration among teachers.

Keywords: Teacher collaboration. Educational quality. School factors. School climate.

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RESUMO

Este artigo teve como ponto de partida a indagação sobre em que medida o trabalho docente coletivo produz diferentes resultados educacionais. O objetivo deste estudo quantitativo foi verificar se a colaboração docente tem impacto sobre a proficiência dos alunos e investigar fatores escolares associados ao aumento da colaboração docente. Foram utilizados dados da Prova Brasil de 2017, referentes ao 5º ano das escolas municipais e estaduais de todo país. A partir das respostas dos questionários contextuais, foram criados indicadores utilizados em regressões lineares que estimaram a relação entre proficiência do aluno e a colaboração docente, e a relação desta última com a percepção dos professores sobre outros fatores escolares. Os resultados indicam que uma maior colaboração entre o corpo docente tem impacto positivo na proficiência e que fatores como liderança do diretor, quantidade de escolas onde o professor trabalha e percepção de agressividade dos alunos estão associados a uma maior ou menor colaboração entre os professores.

Palavras-chave: Colaboração docente. Qualidade da educação. Fatores escolares. Clima escolar.

Introduction

To what extent do the conditions of individual and collective teaching work produce different educational results and contribute to school success? Starting with these questions, we have sought to identify positive impacts on student results due to individual teaching practices and their collective organization at schools. Recent changes in the educational field, especially those that are related to the introduction of accountability policies linked to the results of large-scale evaluations, have brought new configurations to school routines, changing, in many cases, the relational dynamics previously established in this space. Some authors have complained that such policies promote “professional and political disqualification of teachers” (EVANGELISTA; SHIROMA, 2007) due to their emphasis on increasing competition and an individual’s search for productivity. Beginning with these reflections, we argue that the development of collaborative work by teachers can favor students’ proficiency. We believe, therefore, that the maintenance of an environment of cooperation among faculty would go against negative expectations associated with the contexts in which these policies are in force and could also promote better school results.

Thus, this study seeks to answer the following questions: do schools where teachers perform more collaborative work present better results in external

evaluations? And, if so, what affects the level of collaboration between teachers? To try to answer them, we surveyed, through a statistical study, the possible relationships between the collaborative work of the faculty and the results of the students and we tried to identify contextual variables that could interfere in the levels of collaboration between teachers.

The article is divided into six sections, including this introduction. The sections that follow narrate the process of the work developed, including our reflections from studies on the theme (second section), a brief description of the profile of teachers in Brazilian public schools (third section), the methodological procedures adopted at work (fourth section), the presentation of results (fifth section) and our considerations on the results found (sixth section).

Collaborative relationships between teachers in schools: what research tells us

Some research carried out on school effectiveness points to teaching work as one of the key factors for school effectiveness (SAMMONS, 2008; ALVES; FRANCO, 2008). Cohen (1983, *apud* SAMMONS, 2008) pointed out that school effectiveness is clearly dependent on effective teaching in the classroom. However, most of the studies that sought to identify how this effect of teachers operates, were focused on the characteristics of teachers outside the classroom, as pointed out by Lima and colleagues (2019). The authors cite as an example: “time of experience in teaching, educational level and performance in the selection processes for entering the career” (LIMA *et al.*, 2018, p. 3). Thus, there is a need to deepen the relationships that can be established between school results and other characteristics of teaching work, more related to intra-school practices. Pointing out this gap, Lima and colleagues (2019) sought to measure the relationship between student performance and the Pedagogical Practice Indicator, in the context researched. For this research, we propose the analysis of another factor, associated with collaborative practices in teaching.

Collaborative practices at school are considered among the constituent aspects of a school’s climate. Sammons (2008), in his extensive survey of school effectiveness, summarized eleven key characteristics of effective schools. The author presents the second factor as “shared goals and visions”, which include “institutional participation and collaboration” (SAMMONS, 2008, p. 358). Based on the research results analyzed, the author discusses the contribution of teachers’ sense of belonging and involvement to students’ performance.

According to data collected by NREL (1990, as cited by SAMMONS, 2008, p. 358), this involvement of teachers is strengthened by the exchange of ideas between teachers, “learning from each other and working together to improve the teaching program” Torrecila (2008), when synthesizing the results of research on school effectiveness in the Ibero-American context, points to teamwork as one of the factors of effectiveness present in the studies analyzed .

In this sense, several studies have been dedicated to studying interpersonal relationships in the school context. Boyd, Grossman, Lankford, Loeb and Wyckoff (2011), for example, devote special attention to a school’s contextual / relational factors and their impact on teachers’ satisfaction with work and their decisions to stay or leave school, in the USA context. Even though labor and hierarchical relationships in the Brazilian context are different, it is important to pay attention to the high rates of teacher turnover among schools that also occur in Brazil, and the factors that motivate them, considering their negative impact on school results. It is worth noting, then, that the concern with the levels of teacher satisfaction in the performance of her function, that has been made explicit in several surveys (MAY; SUPOVITZ, 2011; PRICE, 2012; SCANLAN, 2013; SHEN *et al.*, 2012; SOMECH, 2010; SUPOVITZ; SIRINIDES; MAY, 2010; THOONEN *et al.*, 2011, among others), reflects more than merely a concern with teachers working conditions. In the set of international surveys cited, the level of job satisfaction reported by a teacher is associated, on the one hand, with the performance of her students, and, on the other hand, with absenteeism, and dropout and teacher turnover rates.

It is noteworthy that research in this field tends to relate the characteristics of teaching (including staff collaboration) to other school factors, especially those related to the educational climate. Hulpia and colleagues (2011), for example, analyze the characteristics of the set of principles that most influence the organizational commitment of teachers. Here the authors bring to the discussion a new concept, *organizational commitment*, which would translate into a strong identification and involvement by the teacher with the school where she works. According to the literature in the area, the authors point out the main characteristics of organizational commitment and its importance for school success, considering that teachers who are committed to their school indirectly influence the commitment of students to their results. Hulpia and colleagues summarize the literature in the field to define the characteristics related to group cohesion (which involves collaboration between peers), which is one of the main factors in organizational commitment:

Group cohesion: Group cohesion is a process whereby a sense of “we-ness” or togetherness emerges to transcend individual differences and motives [...]. It reflects the openness of the team members and their mutual trust, communication, and cooperation (Holtz, 2004). This plays an essential role in team effectiveness (HULPIA *et al.*, 2011, p. 737).

Along the same lines, the work of Thoonem and colleagues (2011) analyzes the impact of leadership practices, the organizational conditions of schools and motivational factors in the practices of teachers. The authors also address teaching collaboration and its influence on the engagement of teachers with training activities.

In a recent study, Costa and Protts (2019) analyze the affective professional engagement of teachers, highlighting interpersonal relationships in the work environment as an important predictor of the level of this professional teaching engagement. In this quantitative study based on PISA data, the authors found a positive association between their indicator of interaction with peers and indicators of professional engagement, job satisfaction and the decision to continue in the profession.

In a national context, Alves and Franco (2008) point out the relevance of the organization and management of a school to the effectiveness of the work developed, highlighting collaborative work among the team as one of its prime characteristics. The authors cite, as an example, the study by Andrade and Laros (2007, as cited in ALVES; FRANCO, 2008) who found a positive association between the collaborative work of the school team and the performance of their third-year students.

Quantitative research, using the proficiency achieved in standardized tests as a reference for student learning, has also sought to understand this relationship. In research on school factors and their relationship with the bonus policy in the city of Rio de Janeiro, Koslinski, Paes de Carvalho, Alves and Macedo (2013) found that schools where teachers report a higher frequency of collaborative practices are more likely to achieve the performance goals set by SME / RJ.

Thus, understanding that teaching collaboration can be considered as one of the main characteristics of effective teaching, a hypothesis which we seek to test in this study, we ask: what are the school factors that could influence this variable? We believe that instability in the composition of the school’s teaching staff could well be one of them.

School turnover, generated by the flux of departure and entry of school teachers, can hinder the development of a school’s pedagogical work, especially when very high, (ALLENSWORTH; PONISCIAK; MAZZEO, 2009;

RONFELTD *et al.*, 2011). Research on dropping out, mobility and teacher turnover has indicated a pattern of turnover that potentially increases educational inequalities (CARRASQUEIRA, 2018). Ronfeldt, Lankford, Loeb, Wyckoff (2011) verified the impact of turnover on the performance of students in the State of New York and found a significant result indicating that the higher the teacher turnover, the lower the children's performance. In addition, the authors also noted that the impact of turnover on performance was greatest for African American, Latin, immigrant, and lower income children.

In order to identify factors associated with turnover, Carrasqueira e Koslinski (2019) carried out a longitudinal study with a cohort of teachers who entered the municipal system in Rio de Janeiro in 2009, 2010 and 2011. In addition to the teachers' characteristics (age, education and experience) and those of students (social vulnerability and socioeconomic level) already observed by previous studies (ALVES *et al.*, 2013; CUNHA, 2015; CARRASQUEIRA, 2018), the survey verified the high impact of the Annual Performance Award on teacher mobility. The main hypothesis for this impact is based on the study by Candian and Resende (2013) who argue that school results, which lead them to achieve or not the goal necessary to win the prize, can be a proxy for the school climate and, as we will discuss below, for teacher turnover and student results.

School climate, a concept that originated in educational climate studies, is characterized by a myriad of factors. Aguerre (2004, p. 55) explains that "climate constitutes the context of shared meanings, pre-understandings that problematically support the individual or collective agreements and actions undertaken by the members of an organization (teachers, administrators and students)". Allensworth, Ponisciak and Mazzeo (2009), using data from several surveys in public schools in Chicago, verified the perception of the actors in relation to issues such as discipline, teacher-student relationships, parental incentives, teacher school commitment, teacher to teacher relationships as well as with parents, the principal and other teachers, among other factors related to an organized educational environment that is focused on learning. This set of factors - called by the authors 'school climate' - has proved to be one of the main enabling characteristics of a school for retaining teachers and positively influencing results, particularly for students from a lower socioeconomic level.

Ribeiro's research (2013) reached conclusions converging with the findings of the aforementioned studies, concluding that schools located in or near low income communities, attract less experienced teachers through transfers from other schools and receive a greater number of newly graduated teachers. Such results seem to highlight the relevance of a teacher's perceptions about the students and the school environment to her permanence, commitment and

consequent perspective of greater collaboration between teachers in the direction of the students' academic success.

We consider, therefore, yet another factor that could be associated with levels of teacher collaboration in schools would be the perception of teachers about the school climate, which involves maintaining a proper environment for learning (SAMMONS, 2008).

Studying intra-school relations, Price (2012) analyzes the organizational relations at school and how they manifest themselves in different levels of satisfaction, cohesion and commitment between principals and teachers, with repercussions on the results of the students. Marcondes et al. (2012), in turn, emphasize the importance of teacher commitment to the school for students' learning, considering that the school management team (especially the pedagogical coordinator) can influence the level of this commitment.

Schools, like those surveyed in this study, where coordinators are able to maintain *collaborative cultures, processes of reflective practices and shared decisions* are more likely to maintain *teachers' commitment to student learning*. (MARCONDES et al., 2012, p. 206)

Taking this hypothesis into account, we propose a reflection on the association between characteristics of the work of the management team (including school leadership) and the collaborative culture within the school (OLIVEIRA, 2018).

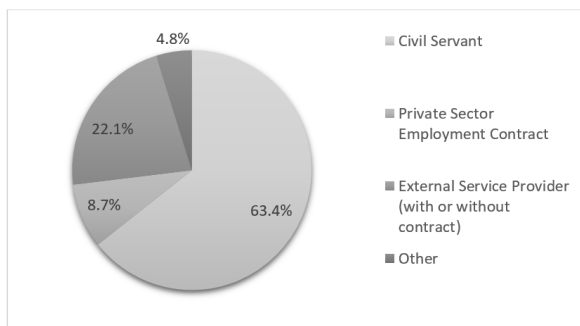
In the research we present here, we focus on teaching collaboration, understanding it as a determinant of the quality of intra-school relationships and, consequently, of the pedagogical work developed in schools. Thus, we are given to understand teaching collaboration as the practices built and stimulated at school among its teachers, involving pedagogical exchanges and collective learning. Furthermore, we understand that these practices, as already pointed out by the research summarized in this section, contribute to a feeling of commitment and cohesion on the part of school teams, thus influencing the quality of school work they develop. Seeking to deepen this discussion, we propose an analysis of this relationship, estimating the relationship between an indicator of teacher collaboration and student performance. Furthermore, we sought to deepen what would be the other school factors that could explain the variation in the results of the teacher collaboration index between schools. We begin, in the next section, by briefly presenting a profile of the teachers whose responses to the questionnaires of Prova Brasil 2017 were analyzed.

Brazilian public school teachers

In this section, we present a general profile of teachers from fifth year classes that took the Prova Brasil, considering the available data on the municipal and state schools from all over Brazil that were tested in the 2017 edition (N = 109905).

Within this group, women (87%) prevail in the age group between 30 and 49 years (71%), among which 44% consider themselves black and 43% white. With regard to academic training, about 7% of these teachers have not received higher education, despite the goals laid out in the recent National Education Plans - PNEs (2000-2010 and 2014-2024), which indicate the need for continuity investment in this area. Almost two-thirds had taken refresher or improvement courses (62%) although less than 2% possessed master's or doctorate degrees.

GRAPH 1- TEACHER LINK AT SCHOOL, TEACHER QUESTIONNAIRES, 2017.



SOURCE: Prepared by the authors based on data from the Prova Brasil 2017 - (INEP / Brasil).

Regarding schoolwork regime, 64.3% of teachers declared they were civil servant. In this respect, discrepancies between states are very large. While in the states of Rondônia, Rio de Janeiro and Paraná more than 80% of the fifth grade teachers who answered the questionnaire claimed to be civil servant (87%, 85% and 83%, respectively), in Acre, Distrito Federal and Mato Grosso less than 40% of the fifth grade teachers who responded are stable (27%, 37% 39%, respectively).

Regarding teacher dedication, that is, in how many different schools a teachers works in, 37.7% of the respondents reported working in 2 or more schools, while in Minas Gerais and Espírito Santo less than half of the teachers (49% in both) reported working in only one school. On the other hand, in the Federal District, only 7% reported working in more than one school.

Data and methodology

As noted, we used data provided by the 2017 edition of Prova Brasil from all participating municipal and state schools in Brazil. The Prova Brasil is a census assessment made up of tests of the Portuguese Language and Mathematics, given to fifth and ninth grade Brazilian public school students with more than 20 students in the evaluated series. The issues of Prova Brasil include contextual questionnaires addressed to principals, teachers in the evaluated grades and the students evaluated.

As a measure of learning performance in schools, we chose to work with the average grade in Mathematics for fifth year Brazilian public school students (state and municipal). It is worth noting that the choice of analyzing the results of fifth grade students is justified by the possibility of comparing them with previous studies that found significant associations between school factors and an increase in Mathematics proficiency at this stage of schooling (ALVES; SOARES, 2007 ; ALVES; FRANCO, 2008; PAES DE CARVALHO *et al.*, 2012; OLIVEIRA, 2018; OLIVEIRA; PAES DE CARVALHO, 2018). As for the choice of this curricular component - Mathematics - it is due to the school-oriented character of this area of knowledge, as pointed out by Rutter, Maughan, Mortimore, Ouston, Smith (2008):

[...] the choice of school subjects [whose learning results will be analyzed] can influence the results [of the research] Consequently, studies by the IEA-International Educational Achievement Survey (Postlethwaite, 1975; Coleman, 1975), the American Project Talent (Shaycoft, 1967) and British research (Brimer *et al.*, 1977) indicated that disciplines such as, for example, Math or science, which is usually learned mainly at school, shows greater differences [in results] between schools than reading, which can be learned in part at home with the help of parents; or others, such as English Literature or Social Studies, in which student learning through television or books available at home, and also in conversations with the family, is likely to have an influence (RUTTER; MAUGHAN; MORTIMORE; OUSTON; SMITH, 2008, p.145-146).

The students' questionnaires offered us information about their socioeconomic status - SES. Regarding this information, it is necessary to consider that we use the parents' level of education as a proxy for students'

SES. We chose to use parents' education as a reference for SES because it considers the close relationship between the socioeconomic strata and the schooling trajectory as already pointed out in several studies (HASEMBALG; SILVA, 2000; SILVA; BARBOSA, 2012; CURI; MENEZES-FILHO, 2006; MENEZES-FILHO, 2007; among others).

Thus, we consider fathers and/or mothers who had high school or higher education. This variable was aggregated by school, with the SES being the proportion of children with a father and / or mother with high school or higher education.

With regard to data from the respondent teachers' questionnaires, it is worth noting the limitation imposed by the methodology for applying the contextual questionnaires. As Franco (2001, p. 130) points out, since only teachers in the grades who are tested by Prova Brasil answer the questionnaires, their answers provide only a partial view of the school. Thus it is worth noting, that the perceptions of this group of teachers about teaching collaboration at school, the leadership of the principal and other aspects raised in this study may not coincide with those of the teaching staff as a whole, thus generating a possible bias in the interpretation of the data.

Only fifth year teachers' contextual questionnaires were used. We excluded duplicate cases (teachers who responded to more than one class) in order to avoid response redundancy.

In this study, we used questions about activities carried out by the teacher with her colleagues to create the Teaching Collaboration Index (COLDOC); questions about the teacher's perception of the director to create the Principal's Leadership Index (ILD); and questions about the teacher's perception of aggressive actions taken by students to create the Teacher Perception Index on Student Aggressiveness (AGRESS).

These indexes were created through factor analysis. Factor analysis is a statistical technique that, in general, makes it possible to extract latent dimensions from a set of variables. That is, to identify variables that capture the same unobservable concept. In addition, in factor analysis, we can reduce these variables to a single factor, creating an index that corresponds to the latent dimension (FIGUEIREDO; SILVA, 2010). The items that generated these indices, their respective factor loads and the validity / reliability indicators (KMO and Cronbach's Alpha) are presented in the Annex to this article.

Next we calculated the mean response value for the school level. Then, through factor analysis, we constructed the indices that we then used as independent and dependent variables in linear regressions - multivariate analysis technique to estimate the expected value of the dependent variable given the values of the independent variables.

By employing the data from the teachers' questionnaires, we defined a variable indicative of the dedication of the teacher to only one school, from the creation of a *dummy* with the responses of the teachers about their dedication to the school. In a second step, this variable was transformed into a new variable indicating the proportion of school teachers with exclusive dedication to it from the sum of teachers with exclusive dedication per school, compared to the total number of teachers who responded to that school unit. The choice of this variable is due to the fact that regardless of the employment relationship, a teacher can be assigned to work in more than one school. In other words, statutory teachers, although they have a more stable link with the network, do not necessarily have exclusive dedication in schools. Although we consider the relevance of the two pieces of information to think about teaching work (type of bond and dedication to one or more schools), we chose in this study to analyze only the dedication to a school unit as a characteristic of teaching work. We understand that the type of link between the teacher and the school is dependent on the policy of the educational system to which she is subject, a theme that, at the moment, is outside the scope of this research (but which will be addressed in future studies).

Finally, from the principals' responses to the contextual questionnaires, we constructed a variable indicative of a principal's experience time. Research such as that of Spillane and Lee (2014) points out the challenges faced by school administrators at the beginning of their careers. The authors especially highlight the construction of their identity after the recent transition from the classroom to the school management office. In this study, we hypothesized that the length of experience of the principal in his position could be a predictor of the level of collaboration between teachers at his school, considering that principals more experienced in their role could be more effective inducers of collaborative practices among teachers in their school. To create this variable, we have recoded principals' response ranges about their experience in school management, thus creating a new *dummy* variable where the value 1 indicates that the principal has more than 10 years of experience as the principal and 0 indicates that the principal has less 10 years of experience in this role.

Teacher collaboration and student results: estimating relationships

Starting from our initial hypothesis, we then proceeded to investigate the possible relationship between collaborative work between teachers and the results of their students in the math tests of Prova Brasil. We estimate

the association between the Teaching Collaboration Index and the average proficiency of fifth grade students in Mathematics through a linear regression, controlling this relationship by the school's average NSE. Table 1 shows the descriptive statistics for these variables.

TABLE 1 - VARIABLES USED IN THE 1ST MODEL

Variable	Type of variable	Description	Minimum	Maximum	Mean	Standard deviation
DEPENDENT						
PROF_MAT	Continuous	Mean mathematics Proficiency	125.82	351.47	214.64	27.46
INDEPENDENT						
SES	Continuous	Proportion of parents with high school or college education	0.0	1.0	0.28	0.14
COLDOC	Continuous	Teacher collaboration index	-2.94	1.62	0.00	1.0

SOURCE: Prepared by the authors based on the Brasil 2017 Test - (INEP / Brasil)

Table 2 summarizes the results found in this first regression model:

TABLE 2 - COEFFICIENTS OF THE 1ST ESTIMATED MODEL

	<i>b</i>	Signif.	E.P.
Constant	189.4	0.0	0.55
SES	87.7	0.0	0.08
COLDOC	4.6	0.0	0.12
R² = 0.54			

SOURCE: Prepared by the authors based on the Brasil 2017 Test - (INEP / Brasil).

The analysis of the results of the linear regression, employing the results of fifth year students' Mathematics tests as a dependent variable and the average SES of the school as a control variable, showed that the Teacher Collaboration Index created (COLDOC) is positively associated with school results. From this result we can infer that collaboration between teachers favors an appropriate institutional climate for more effective pedagogical work, which, in turn, is conducive to good student performance. As the regression data showed (the R² indicators), the variables used in the estimated model were responsible for explaining about 25% of the variation in the Mathematics results of fifth graders

in the 2017 edition of Prova Brasil. This result indicates that, once characteristics related to the social origin of the students are controlled (through the average SES of the schools), the variable used in the model (Teaching Collaboration Index) would explain about 25% of the variation of the results of fifth graders in Mathematics in the observed period.

This statistically significant and positive association between the variables indicates that an increase of one point in the Teaching Collaboration Index (as stated by the teachers) results in an increase of 4.76 points in the average result in fifth graders' Math tests. This offers important clues for reflecting on school aspects that can favor students' proficiency, regardless of their social origin (CREEMERS; REEZGIT, 1996; ALVES; FRANCO, 2008; SAMMONS, 2008). In the discussion, we prioritized the importance of collaborative teaching work, especially with regard to the exchange of materials, information and experiences with school colleagues. The results indicate that the increase in the level of teaching collaboration reduces the impact of SES on the distribution of mathematical proficiency among students. This result corroborates the findings of the research by Koslinski et al. (2013), which showed that schools where teachers report a higher frequency of collaborative practices are more likely to achieve higher results in external evaluations.

In the second stage of the study, we sought to identify the variables that affect the level of teacher collaboration in schools. That is, considering the importance of teaching collaboration for school results, what could influence the Teaching Collaboration Index or the perception of teachers about these practices at school? We next tested the correlations between the variables created (presented in the previous section) and developed a new linear regression model, with the Teacher Collaboration Index as the dependent variable. Table 3 shows the descriptive statistics for these variables:

TABLE 3 - VARIABLES UTILIZED IN MODEL 2

Variable	Type of variable	Description	Minimum	Maximum	Mean	Standard deviation
DEPENDENT						
COLDOC	Continuous	Teacher collaboration index	-2.94	1.2	0.00	1.00
INDEPENDENT						
N_PROF	Discrete	Number of responding teachers by school	1	20	2.31	1.59
ILD	Continuous	Principal's leadership index	-3.66	1.25	0.00	1.00
DED_EXCL	Continuous	Proportion of teachers dedicated exclusively to that school unit	0.00	1.00	0.64	0.41
AGRESS	Continuous	Student aggression teacher perception index	-1.33	1.37	0.12	1.00
Variable	Type of variable	Description	Categories		Valid percentage	
EXP_DIR	Binary	Principal with more than 10 years in school management.	No = 0 Yes = 1		No = 85% Yes = 15%	

SOURCE: Prepared by the authors based on the Brasil 2017 Test - (INEP / Brasil).

In this analysis we chose to use as a control measure the number of teachers who answered the questionnaire in each school (N_PROF). Although this number is not representative of the school's teaching staff, as pointed out by Oliveira (2018), it can be used as an indication of the number of classes the school serves in the fifth year. In this sense, we consider that the size of the teaching staff could be an important predictor for the relationships established at the school, including the level of teaching collaboration. The data presented show that, among the Brazilian public schools participating in the Prova Brasil 2017, there were an average of 2.31 respondent teachers (teaching in the fifth year).

Table 4 summarizes the results found in this second regression model:

TABLE 4 - COEFFICIENTS OF THE 2ND ESTIMATED MODEL

	<i>b</i>	Signf.	E.P.
Constant	-0.418	0.00	0.01
N_PROF	0.167	0.00	0.00
ILD	0.258	0.00	0.00
EXP_DIR	0.126	0.00	0.01
DED_EXCL	0.036	0.00	0.01
AGRESS	-0.016	0.00	0.00
R² = 0.141			

SOURCE: Prepared by the authors based on data from the Prova Brasil 2017 - (INEP / Brasil).

The statistically significant results allow us to infer that teachers tend to be more collaborative when they have a better perception of the principal's leadership - which is expressed in the Principal's Leadership Index (ILD), when this principal has more than 10 years of experience in his function and when the school has a higher percentage of teachers working solely in that unit. On the other hand, a negative result of a high student aggressiveness perception index indicates that teachers report a lower intensity of collaborative practices in school environments where they perceive higher levels of aggression on the part of students.

We highlight the importance of the principal's role in developing/building a more collaborative environment among teachers, corroborating research findings such as those of Marcondes et al. (2012), among the several others already mentioned, emphasizing the importance of teacher commitment to a school for student learning and school management's influence on this commitment.

Final considerations

The present study seeks to contribute to discussions about school equity from the perspective of teaching practices, with an emphasis on those that enable collaborative relationships around pedagogical practice, without losing sight of school unit context. In addition to corroborating previous research regarding the benefits of teaching collaborative practices to reduce the effects of students' socioeconomic background on the results achieved in external evaluations, thus contributing to greater equity in school work, the study also presented and discussed in an exploratory way other intra-school variables that may influence the greater or lesser presence of such teaching practices in schools. Among the factors analyzed, we highlight the leadership and the experience of the principal in her role. In addition to this factor, already pointed out in several national and international surveys, one can also infer the positive effect of aspects of the teacher's working conditions - such as her dedication to only one school - and the negative effect of the teacher's perception of aggressiveness on the part of her students.

Although the results presented here are exploratory and do not indicate a causal relationship between the variables studied, they constitute relevant indications of the importance of teacher collaboration as well as working and management conditions that favor all parties for a more equitable distribution of learning in Brazilian public schools, which deserve further study.

Therefore, we will seek in future research to deepen our analyses, observing other possible characteristics via the contextual questionnaires of Prova Brasil in regard to teacher perceptions of school environment, management and their working conditions.

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Annex

To construct the variables for the Teacher Collaboration Index (COLDOC), Principal's Leadership Index (ILD) and Teachers' Perception Index on Student Aggressiveness (AGRESS), the factor analysis technique with extraction of main components, exclusion by peers and Varimax rotation, based on the responses to the contextual questionnaire of fifth grade teachers from Prova Brasil that were aggregated by the average for the school level. In all three cases only one factor was extracted.

The questions used to create COLDOC and ILD were on a frequency scale (never; once a year; 3 to 4 times a year; monthly; weekly), while the questions used to create AGRESS were of the YES / DO NOT.

The questions used, the factor loads and the validity / reliability indicators (KMO and Cronbach's Alpha) are presented in the following tables:

TABLE 5 - FACTOR LOADS OF VARIABLES RELATED TO THE TEACHER COLLABORATION INDEX (COLDOC), TEACHERS' QUESTIONNAIRES, 2017.

Variables	Factorial Loads
Exchanged teaching materials with colleagues (Q54)	0.797
Participated in meetings with colleagues who work with the same grade (year) for which she teaches (Q55)	0.791
Engaged in joint activities with different teachers (for example, interdisciplinary projects) (Q57)	0.761
	KMO 0.665
	Cronbach's Alpha 0.678

SOURCE: Prepared by the authors based on data from the Prova Brasil 2017 - (INEP / Brasil).

TABLE 6 - FACTOR LOADS OF THE VARIABLES RELATED TO THE PRINCIPAL'S LEADERSHIP INDEX (ILD), TEACHERS' QUESTIONNAIRES, 2017.

Variables	Factorial Loads
The principal gives special attention to aspects related to student learning. (Q61)	0.827
The principal cheers me up and motivates me to work. (Q64)	0.889
The principal encourages innovative activities. (Q65)	0.870
I feel respected by the principal. (Q66)	0.809
I have full confidence in the principal as a professional. (Q67)	0.862
KMO	0.832
Cronbach's Alpha	0.904

SOURCE: Prepared by the authors based on data from the Prova Brasil 2017 - (INEP / Brasil).

TABLE 7 - FACTOR LOADS OF VARIABLES RELATED TO THE TEACHERS' PERCEPTION INDEX ON STUDENT AGGRESSIVENESS (AGRESS), TEACHERS' QUESTIONNAIRES, 2017.

Variables	Factorial loads
Verbal or physical aggression by students to teachers or school staff (Q83)	0.873
Verbal or physical aggression of students to other students at school (Q84)	0.873
KMO	0.500
Cronbach's Alpha	0.687

SOURCE: Prepared by the authors based on data from the Prova Brasil 2017 - (INEP / Brasil).