

PEDAGOGICAL SELF-EFFICACY OF SCHOOL AGENTS: INTERACTIONS AND INFLUENCE ON SCHOOL PERFORMANCE IN DIFFERENT REGULATORY CONTEXTS

AUTOEFICÁCIA PEDAGÓGICA DE ATORES ESCOLARES: INTERAÇÕES E INFLUÊNCIA NO DESEMPENHO ESCOLAR EM DIFERENTES CONTEXTOS NORMATIVOS

AUTOEFICACIA PEDAGÓGICA DE LOS ACTORES ESCOLARES: INTERACCIONES E INFLUENCIA EN EL DESEMPEÑO ESCOLAR EN DISTINTOS CONTEXTOS NORMATIVOS



Cynthia PAES DE CARVALHO¹
e-mail: cynthiapaesdecarvalho@puc-rio.br



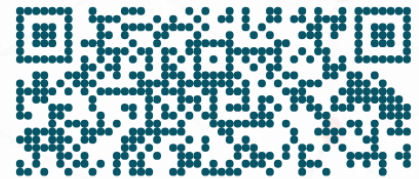
Daniela Natasha Mendes ARAI²
e-mail: danielanma@gmail.com



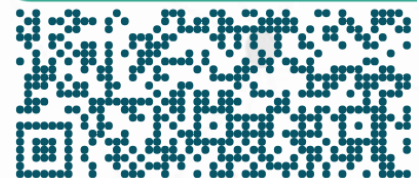
André Luiz Regis de OLIVEIRA³
e-mail: andre.regis.oliveira@gmail.com

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¹ Pontifical Catholic University of Rio de Janeiro (PUC-Rio), Rio de Janeiro – RJ – Brazil. Associate Professor II at the Department of Education.

² Federal University of Rio de Janeiro (UFRJ), Rio de Janeiro – RJ – Brazil. Doctoral degree student in the research line of Educational Policies and Institutions, Faculty of Education.

³ Federal University of Rio de Janeiro (UFRJ), Rio de Janeiro – RJ – Brazil. Professor at the University's Application School (CAp-UFRJ).

ABSTRACT: The article discusses the pedagogical self-efficacy beliefs of teachers, pedagogical coordinators, and school principals and their relation with student results in a sample of 139 schools in the states of Espírito Santo and Piauí. Data from the questionnaires applied to these actors in the research Management Practices, Educational Leadership and Quality of Education in High Schools in Brazil (PGLEQE), from the School Census, SAEB, and state assessments were used. A documentary survey and interviews with key players from the central bodies of each state system were carried out on the regulations related to school management in order to understand the regulatory context and deepen the analysis. The analyses are in line with national and international research that points to the belief in self-efficacy as one of the mediating aspects that influence school results. The results partially confirm the findings of the literature and point to future research perspectives.

KEYWORDS: Pedagogical self-efficacy. Normative contexts. School actors. School performance.

RESUMO: *O artigo discute a crença de autoeficácia pedagógica de professores, coordenadores pedagógicos e diretores escolares e sua relação com os resultados dos estudantes em uma amostra de 139 escolas de ensino médio dos estados do Espírito Santo e Piauí. São utilizados dados dos questionários contextuais aplicados a estes atores na pesquisa Práticas de Gestão, Liderança Educativa e Qualidade da Educação em Escolas de Ensino Médio no Brasil (PGLEQE), dados do Censo Escolar, do SAEB e das avaliações estaduais. Realizou-se um levantamento documental e entrevistas com atores-chave dos órgãos centrais das redes sobre as normas relativas à gestão escolar para compreender o contexto normativo e adensar as análises em cada estado. As análises dialogam com pesquisas nacionais e internacionais que apontam a crença na autoeficácia como um dos aspectos mediadores que influenciam os resultados escolares. Os resultados confirmam parcialmente os achados da literatura de referência e apontam perspectivas futuras de investigação.*

PALAVRAS-CHAVE: *Autoeficácia pedagógica. Contextos normativos. Atores escolares. Desempenho escolar.*

RESUMEN: *El artículo discute las creencias de autoeficacia pedagógica de profesores, coordinadores pedagógicos y directores de escuela y su relación con los resultados de los alumnos en una muestra de 139 escuelas secundarias de los estados de Espírito Santo y Piauí. Se utilizaron datos de los cuestionarios aplicados en la investigación Prácticas de Gestión, Liderazgo Educativo y Calidad de la Educación en la Enseñanza Media en Brasil (PGLEQE), del Censo Escolar, SAEB y las evaluaciones estaduais. Se realizó un relevamiento documental y entrevistas con actores de los órganos centrales de las redes sobre las normas correspondientes a la gestión escolar para comprender el contexto normativo y profundizar los análisis. Los análisis están en línea con las investigaciones nacionales e internacionales que señalan la creencia en la autoeficacia como uno de los aspectos mediadores que influyen en los resultados escolares. Los resultados confirman parcialmente los hallazgos de la literatura y señalan futuras perspectivas de investigación.*

PALABRAS CLAVE: *Autoeficacia pedagógica. Contextos normativos. Actores escolares. Resultados escolares.*

Introduction

The literature on school effectiveness has shown that school management is one of the most essential intra-school factors for student performance, second only to teaching practices (Leithwood; Harris; Hopkins, 2008; Sammons, 2008; Soares, 2008). In the same vein, research in the field of school management has gathered evidence that the pedagogical dimension of leadership is the one that most influences learning, especially when shared with teachers and integrated into a transformational perspective, which emphasizes the role of managers as change agents committed to increasing the motivation of the pedagogical team and creating a collaborative culture in schools (Marks; Printy, 2003).

Studies on school management also point to leadership as a "distributed" and "situated cognition" activity, associated not only with the figure of the principal but with the interactions among various leaders and followers in various local arrangements constructed around specific situations (Spillane; Halverson; Diamond, 2008). Adopting this perspective, this work seeks to contribute to understanding one of the mediating aspects between context and practice in schools: the pedagogical self-efficacy beliefs of school actors.

To this end, it is dedicated to the elaboration of indices of pedagogical self-efficacy of principals, pedagogical coordinators, and teachers, as well as to examining their relationship with students' results in external assessments. Since self-efficacy beliefs are influenced by the situation, Bandura (1977) also analyzes the possible relationships between actors' beliefs and context variables, including the indices of support and supervision from regional education authorities, which are also constructed within the scope of this work. Finally, an exercise is carried out to combine actors' beliefs in a configuration of the collective efficacy of schools.

Theoretical Framework

Self-efficacy beliefs are one of the central concepts that make up Bandura's social cognitive theory (1986), which proposes that external factors, such as socioeconomic condition and family or educational structures, do not directly affect human behavior but indirectly "to the extent that they influence people's aspirations, self-perceptions, personal standards, emotional states, attitudes, and other self-regulatory influences" (Bandura; Azzi; Polydoro, 2008, p. 100, our translation).

Defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391, our

translation), self-efficacy beliefs are one of the personal competence beliefs that most influence human motivation and achievements. "This is because, unless they believe that their actions can produce the outcomes they desire, people will have little incentive to act or to persevere in the face of difficulties" (Bandura; Azzi; Polydoro, 2008, p. 101, our translation).

Given its importance in explaining motivation and behavior, self-efficacy belief has been the subject of research in the educational field. Iaochite *et al.* (2016) state that this construct has been gaining relevance in Brazilian academic production over a ten-year period (2002-2013), with national research focusing on three domains: academic self-efficacy, teaching self-efficacy, and self-efficacy in higher education. The authors describe teaching self-efficacy as "the judgment that the teacher makes about their abilities to teach, even to disinterested and unmotivated students" (p. 46, our translation) and relate it to teacher satisfaction and motivation, high expectations for their students, and the use of diverse teaching strategies. Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) also link teaching self-efficacy to teachers' levels of organization, planning, and sense of fairness, as well as their clarity and enthusiasm in teaching (p. 214). In terms of effects on learning, Tschannen-Moran and Woolfolk Hoy (2007) report that teaching self-efficacy is associated with students' self-efficacy beliefs, motivation, and performance, according to empirical research accumulated over the past decades.

Regarding the antecedents of teaching self-efficacy, Iaochite *et al.* (2016) highlight that, according to international studies, "managers and coordinators have a significant influence on teachers' self-efficacy and on how they interact within the school" (p. 48, our translation). Tschannen-Moran and Woolfolk Hoy (2007) report that contextual variables, such as school structure and climate and principal leadership, have been more associated with teaching self-efficacy in the literature than personal characteristics, which consistently appear unrelated to this construct (such as gender and race) or only slightly related (as is the case with experience in the role).

Despite evidence that managers influence teachers' self-efficacy, the belief of these actors is less studied. According to Fisher (2011), this can be classified into three domains according to the tasks it refers to: pedagogical, general administrative, and emotion-related and interpersonal relationships, with managers, in their study, reporting greater perceived self-control over pedagogical tasks.

Drawing from international literature, Guerreiro-Casanova and Azzi (2012) found a relationship between managers' self-efficacy beliefs and management practices aimed at

promoting curricular changes and teaching strategies, better working conditions, perception of teaching self-efficacy, and student performance in assessments. Regarding the association with student outcomes in Brazil, the authors found no significant association between the self-efficacy belief of principals from 26 schools in the state network of São Paulo and results in the IDESP (Education Development Index of the State of São Paulo).

Gino (2023), in an analysis of SAEB 2019 data for Brazil and for the municipal network of the city of Rio de Janeiro, found a small but positive correlation between the pedagogical self-efficacy belief of the principal and students' proficiency in mathematics in the 5th and 9th grades of elementary school, with only the 9th grade in Rio de Janeiro not showing statistical significance (possibly due to sample size). Regarding equity results, the author states that principals' self-efficacy is related to an increase in inequalities in student performance⁴ in the 5th and 9th grades of elementary school in the case of Brazil's 2019 data. This correlation is also observed in the case of the 9th grade in the municipal network of Rio de Janeiro, but does not apply to the 5th grade of elementary school in the same network. According to the author, these results may suggest that even principals with high pedagogical self-efficacy beliefs may not be adequately considering the need to reduce inequalities.

In relation to the antecedents, intra or extra-school factors that may influence managers' self-efficacy beliefs, the literature has presented heterogeneous results. Casanova and Russo (2016) synthesized the variables associated with managers' self-efficacy in the literature and found that while some studies show significant correlations between personal characteristics of managers (such as race, gender, and years of experience), others do not demonstrate these relationships. Regarding training, there is evidence pointing to the positive and significant relationship between the quality of professional training and managers' self-efficacy, although their academic background does not appear to be related to professional training.

In terms of socioeconomic level, there are studies reporting no relationship between contexts of greater vulnerability and managers' self-efficacy, and others finding higher levels of self-efficacy among these actors in these contexts. Regarding support from higher instances, the authors report several studies where this is one aspect that most contribute to explaining managers' self-efficacy.

The results of an online survey conducted with 228 principals from the state public network of São Paulo, as demonstrated by Casanova and Russo (2016), corroborate the findings

⁴ Gino (2023) uses the standard deviation of mathematics proficiency per school in Prova Brasil 2019 as a proxy for equity.

of the international literature regarding the lack of correlation between personal characteristics such as gender and age, and the length of time in the position. However, the authors identified that managers with higher self-efficacy are those who lead elementary schools with fewer students, have initial training in pedagogy, demonstrate agreement with the policy regarding the Education Development Index of the State of São Paulo (IDESP), and claim to be satisfied with their work.

These results are in line with the international literature insofar as they confirm the importance of contextual variables in explaining managers' levels of self-efficacy. Bandura (1977) proposes that self-efficacy beliefs are context-specific, which justifies the growing interest in the concept of collective efficacy, especially that of teachers. The concept of collective efficacy is more recent in the literature and refers to the "shared belief by a group in their joint capabilities to organize and execute the courses of action required to produce given levels of attainments" (Bandura, 1997, p. 477, our translation). Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) define teachers' collective efficacy more broadly as "the extent to which perceptions of efficacy, high or low, are shared among teachers in a school" (p. 221, our translation).

Leithwood and Jantzi (2008) propose two types of self-efficacy beliefs for school leaders: beliefs about the efficacy of each actor to improve teaching and learning (self-efficacy) and beliefs about the ability of colleagues in the district⁵ schools to improve student learning (collective efficacy of leaders). To measure leaders' collective efficacy, the researchers included items in the survey questionnaires, administered to 96 principals and 2674 teachers in 9 American states, such as "To what extent do you agree that the teams in your regional schools have the knowledge and skills they need to improve student learning" (Leithwood; Jantzi, 2008, p. 512, our translation).

As a result, they found that leaders' collective efficacy is an "important link between regional governing body conditions and conditions found in schools and their effects on student performance" (p. 496, our translation) and has a positive relationship with leadership practices deemed effective in previous studies. Although they did not find a correlation between the types of leaders' self-efficacy and the average student performance results in external assessments,

⁵ The authors refer to the School District in reference to the organization of the American educational system, standardized by the states of the federation and managed locally by a "district" or regional superintendency. It is an intermediate management unit between the federal state (in the USA) and schools - which, in the text, we chose to translate as "regional management body" or "regional", which we can identify as a type of department or secretariat of education responsible for supervising schools in a given geographic area or district (region) which, in the case of municipalities or small towns, is the same as the local/regional school network itself.

they found a weak but significant effect between a combined measure of these two forms of efficacy (self and collective) on the proportion of students classified at the proficient level or above.

These effects are most likely indirect through conditions created by leadership in the school and classrooms, with collective efficacy accounting for most of the variation in these contextual conditions compared to self-efficacy. The effects also proved to be significantly moderated regarding contextual characteristics such as the size of the regional governing body, the school level (whether primary or secondary school or high school), and the degree of principal turnover, such that the impact was diminished in large regions, in schools with secondary or high school levels, and even in those with high principal turnover.

Regarding antecedents, school factors, or individual characteristics that may influence actors' self-efficacy levels, it was found that demographic characteristics (race, gender, and experience) were not correlated with efficacy levels. Similarly, investments by the regional governing body in developing instructional leadership showed no association, and the organizational conditions provided by the region did not have a greater impact on collective efficacy than on individual efficacy.

The culture of the region, when characterized by a focus on learning and a collaborative nature, had an effect on both collective and individual measures. These results reinforce the importance of further studying the relationship between the support offered by educational networks (especially structures closest to schools, such as educational regions in large networks, in the case of Brazil) and the development of managers' beliefs and practices, as well as the effects on student learning mediated by teaching and learning conditions in schools.

Methodology and Research Data

Participants, Instruments, and Data

The data analyzed regarding teachers and managers originate from the application of contextual questionnaires from the research "Management Practices, Educational Leadership, and Education Quality in High Schools in Brazil" (PGLEQE), applied in 2022 to directors, coordinators, and teachers from a sample of 139 high schools in the states of Espírito Santo and

Piauí⁶. Student performance data come from the state external assessments in Portuguese language and mathematics in 2022 (Basic Education Assessment Program of Espírito Santo - PAEBES and Educational Assessment System of Piauí - SAEPI).

Data on school context were also employed, extracted from the School Census 2022 questionnaires and the contextual questionnaires of SAEB 2021. Information about the normative context in which these schools are inserted was collected through document analysis and enriched by interviews conducted with key actors from the state education departments of Espírito Santo and Piauí. This encompassed the main policies related to school management and teacher hiring.

Data Analysis Methodology

In this study, we used the items related to the self-efficacy dimension from the PGLEQE⁷ questionnaires to create the index of pedagogical self-efficacy of the principal, the index of pedagogical self-efficacy⁸ of the pedagogical coordinator, and the index of pedagogical self-efficacy of the teachers. For the elaboration of the support and supervision indices of the regional offices, we used the questions regarding the perception of support from the regional education offices in the directors' questionnaire⁹. The indices were created through factorial analysis, and the items used, their factorial loads, and reliability indicators are presented in the "data analysis and results" section of this article.

The statistical technique used for creating the self-efficacy indices was factorial analysis, which consists of analyzing the variables in search of a common dimension among them that can synthesize them into a smaller quantity of variables. In the present study, only one dimension was found for each factorial analysis, with a standardized index (mean zero and standard deviation equal to one). After calculating the indices, we conducted the study of the antecedents of actors' self-efficacy, correlating the respective indices with context variables that, according to the literature, would have greater power to explain the levels found. The support and supervision indices of the regional offices were also tested as antecedent variables of the directors' self-efficacy indices.

⁶ For more detailed information about the Research, see Oliveira *et al.* (2024) in the opening article of this dossier "Dossiê: Práticas de Gestão, Liderança Educativa e Qualidade da Educação em Escolas de Ensino Médio no Brasil" published in this issue.

⁷ Items 13.1 to 13.7 of the principal's questionnaire, items 14.1 to 14.7 of the Pedagogical Coordinator's questionnaire and items 20.1 to 20.14 of the teacher's questionnaire.

⁸ The items used to compose each of the indexes will be explained and justified later.

⁹ Items 31.1 to 31.7 and 32.1 to 32.14 of the director's questionnaire.

Next, based on the formulated indices and selected contextual variables, regression models were developed to investigate their relationship with student outcomes. The initial hypothesis, as indicated by the literature, is that self-efficacy indices would have some impact on the mathematics performance of 3rd-grade high school students when controlled for the average socioeconomic level of the schools. Finally, we categorized the self-efficacy indices into three levels: low, medium, and high, and then constructed a matrix with the purpose of identifying schools and their respective patterns of collective efficacy¹⁰ by combining the beliefs of various actors into an analytical matrix that could generate useful information for the discussion on the collective efficacy of schools.

Data Analysis and Results

Normative context of the state network in Espírito Santo

In the state education network of Espírito Santo in 2022¹¹, the technical-pedagogical teams of the school units were composed of the school principal; pedagogical coordinator (only for full-time schools¹²); administrative, secretarial, and financial coordinator; pedagogue; area coordinator teacher; school coordinator, and school secretary. A decree regulated the duties of these actors, and the pedagogical management tasks were distributed among the principal, pedagogical coordinator (in schools where this function existed), pedagogues, and area coordinator teachers, with the first two being gratified functions exclusively assumed by civil servants through competitive examinations.

The selection of the principal and pedagogical coordinator in the network was conducted through a selection process led by the Department of Education and the Regional Superintendencies of Education (SRE). There was no time limit for holding the position, which was evaluated annually. Pedagogues who were part of the pedagogical team but did not teach classes (responsible for pedagogical management tasks with teachers) entered the position through public competition or temporary designation. These professionals were required to have initial training in Pedagogy, with pedagogical coordinators being able to have training in

¹⁰ The sense of collective efficacy is inspired by what Leithwood and Jantzi (2008) discussed; however, given the absence of the type of information used by the authors in the research questionnaires, it was constructed with this matrix.

¹¹ 2022 was the year in which the PGLEQE questionnaires and external assessments used in this study were applied.

¹² Until 2023, this function only existed in full-time schools (in which it was responsible for the basic general training of the curriculum, while the pedagogue(s) was responsible for the diversified part). From that year onwards, it became part of the larger schools (around 80% of the network).

Pedagogy or teaching degrees, provided they were part of the network staff as permanent employees and had a minimum teaching experience of two years (Pedagogy) and five years (teaching degrees).

Area coordinator teachers (permanent or temporary) were chosen by peers and validated by principals. The SRE was responsible for evaluating the principals along with the central agency and for "planning, coordinating, supervising, guiding, monitoring, and regulating the operation of the state schools in their jurisdiction in physical, administrative, pedagogical, and legal aspects¹³".

In terms of teacher hiring, the network had entry through public competition or by temporary appointment contract valid for one year, renewable for another year, depending on the principal's evaluation of the contractor's performance. In the sample of this research, 213 permanent teachers were identified in Espírito Santo, out of the 682 who responded to the questionnaires (approximately 31% permanent and 69% temporary).

Normative context of the state network in Piauí

In the state education network of Piauí in 2022, the school management team consisted of a principal and a pedagogical coordinator, both with gratified functions, in addition to the school secretary. The principals who were in office that year mostly entered through a mixed process that involved entry into a management bank (through a course and certification) and election¹⁴, with a two-year term, extendable for another two years, according to an evaluation conducted by the regional management and central agency. In the case of coordinators, school selection was based on scoring in the selection process. The minimum requirement for participation in the process for both functions was to have a bachelor's degree in any area and two years of teaching experience. The pedagogical management tasks were formally assigned to both, but only the principals signed a management contract committing to results and were evaluated by the Regional Management of Education (GRE) and the State Department of Education.

It was the responsibility of the GRE to supervise schools and provide support for pedagogical planning. Also in Piauí, teacher hiring could be done through competition,

¹³ Ordinance No. 090-R/2022. (Espírito Santo, 2022)

¹⁴ Except in schools with less than 200 students, in which the principal was appointed by the secretariat. In 2016, the last election of directors took place. As of 2023, new directors will only enter through a selection process conducted by the education department (registration, course, certification, and interview).

temporary contract through a selection process, and temporary contract without a selection process¹⁵. In the sample of this research, 330 permanent teachers were identified in Piauí out of the 619 who responded to the questionnaires (approximately 53% permanent and 47% temporary).

Construction of self-efficacy indices for school actors and supervision and support indices from regional education offices

In this section, we present the processes of constructing the indices from the items of the questionnaires of teachers, coordinators, and principals of the PGLEQE survey.

Index of Teacher Pedagogical Self-Efficacy (ITPSE)

To elaborate on the Index of Teacher Pedagogical Self-Efficacy (ITPSE), the responses of teachers on a scale assessing how prepared they felt to develop different aspects of teaching (items 20.1 to 20.14) were considered. After conducting an exploratory¹⁶ analysis with all items, evaluating their respective factor loads according to the meaning of the described aspect, we chose to consider only the items that expressed direct pedagogical action with students in the classroom.

The choice of items was based on theoretical and empirical analysis, considering the resulting load from the exploratory factor analysis and the accumulation of evidence in the literature on the relevance of the described task for school effectiveness (student learning) and teachers' sense of self-efficacy. According to the literature, teachers who have high expectations for all their students adapt and diversify teaching practices and use assessment to collect evidence and provide feedback (Sammons, 2008) to achieve better results. In the same direction, the literature on teacher self-efficacy indicates that more self-effective teachers are more likely to innovate and persist in teaching students with difficulties (Tschannen-Moran; Woolfolk Hoy; Hoy, 1998). The corresponding factor loads and the statistics of fit, consistency, and reliability are presented in Table 1 below:

¹⁵ When the reserve of candidates approved in the annual selection process is exhausted within the year.

¹⁶ The exception was item 20.13 (Serving students with disabilities so that they learn the concepts of their subject) due to its low contribution in terms of differentiating levels of teaching self-efficacy, which indicates that it is a practically universal difficulty.

Table 1 - Items composing the Index of Teacher Pedagogical Self-Efficacy

Items	Espírito Santo	Piauí
Dealing with learning problems in your classes	0,882	0,867
Meeting the needs of students with greater difficulty so they learn the content of your subject	0,877	0,877
Designing and conducting good learning assessment procedures for your students	0,833	0,832
KMO¹⁷	0,713	0,712
Cronbach's Alpha¹⁸	0,830	0,822
% of explained variance	74,65%	73,82%

Source: Developed by the authors (2023).

Index of Principal Pedagogical Self-Efficacy (IPPSE) and Index of Pedagogical Coordinator Pedagogical Self-Efficacy (ICPSE)

To elaborate on the IPPSE and the ICPSE, exploratory factor analysis was conducted with all relevant items (13.1 to 13.7 from the principal questionnaires and 31.1 to 31.14 from the coordinator questionnaires), aiming to evaluate their factor loads concerning the described aspect. Subsequently, it was decided to include only the items that reflected a direct interaction with the teachers present in both questionnaires.

The choice of items was also based on a theoretical and empirical analysis that sought to encompass the perspective of distributed leadership (between principals and coordinators), capable of being interpreted as integrated at the level of each school, producing indices of self-efficacy of principals and pedagogical coordinators based on a common set of items. We then selected items common to both questionnaires that showed the highest loads in the exploratory factor analysis for both actors in the two states. Items with possibly ambiguous¹⁹ wording or interpretation were excluded.

The resulting items were consistent with the literature, which shows that management is more effective in achieving learning outcomes when it focuses on supporting teachers to

¹⁷ Kaiser-Meyer-Olkin Criterion (KMO) - measure used to quantify the degree of intercorrelations between variables, which varies between 0 and 1, so that: “values less than 0.5 are considered unacceptable, values between 0.5 and 0.7 are considered mediocre; values between 0.7 and 0.8 are considered good; values greater than 0.8 and 0.9 are considered excellent and excellent, respectively” (Hutcheson; Sofroniou, 1999 *apud* Damasio, 2012).

¹⁸ Cronbach’s Alpha is an assessment of the internal consistency of the items; that is, the items must measure the same construct and thus be highly interrelated. George and Mallery (2003) “suggest that a > 0.90 = excellent; a > 0.80 = good; a > 0.70 = acceptable; a > 0.60 = questionable; a > 0.50 = poor; a < 0.50 = unacceptable” (*apud* Damasio, 2012).

¹⁹ Item 7, which dealt with “Leading initiatives that promote the improvement of the performance of school students in external assessments and other exams (ENEM, Vestibular)”, could be interpreted as indicating a focus on learning or on “preparing for the test” and its factor loading was only relevant for coordinators. Item 3, with the wording: “Stimulate changes in the way interactions between teachers and between teachers and students are carried out.” had two issues in its scope: the relationship between teachers and (ii) between teachers and students.

improve instruction (pedagogical leadership) and when it creates an academic and motivational climate in the school (transformational leadership). Table 2 below shows the items present in both questionnaires, along with their factor loads and analysis statistics²⁰:

Table 2 - Items and factor loads of the variables composing the Index of Pedagogical Self-Efficacy of Coordinators and Principals

Factor Load		Coordinator		Principal	
		Espírito Santo	Piauí	Espírito Santo	Piauí
Factor Load	Promoting changes in how each teacher conducts their activity within the classroom (teaching methods and practices)	0,853	0,913	0,859	0,864
	Creating an environment of appreciation or motivation for learning in your school	0,853	0,913	0,859	0,864
	KMO	0,500	0,500	0,500	0,500
	Cronbach's Alpha	0,607	0,799	0,859	0,660
	% of explained variance	72,77%	83,40%	73,84%	74,66%

Source: Developed by the authors (2023).

Indices of Support and Supervision from the Regional Education Directorate (ISRSD) and (ISRSD)

To construct the ISRSD and ISRSD, we considered only the responses of the principals, on a scale of agreement (What is your level of agreement or disagreement with the following statements about the Regional Education Directorate?). The items and their respective factor loads, as well as the adjustment, consistency, and reliability statistics, are detailed in Table 3.

²⁰ The low levels (but still within acceptable limits) for the reliability indicators of these indices can be interpreted in light of the states' normative context. One hypothesis concerns the possible lack of clarity, in the territories, of the responsibilities of managers (directors and pedagogical coordinators) with regard to tasks related to the pedagogical dimension, either because the regulations do not clearly explain the distinctions between the roles of these two actors (case of Piauí), or because the distribution of tasks between these and other members of the management team are not reflected in the way the questionnaires were structured (case of ES).

Table 3 - Items composing the Support Index of the Regional Education Directorate

Items	Espírito Santo	Piauí
Items Espírito Santo Piauí Involved you in the decisions it made regarding this school	0,782	0,713
This school has ensured that it has the technical support it needs to improve its teaching-learning	0,867	0,839
Ensured that this school had the physical conditions and equipment to operate properly	0,823	0,784
Took care to offer technical and pedagogical support to support the analysis of information about your school's results	0,874	0,860
KMO	0,818	0,770
Cronbach's Alpha	0,845	0,804
% of explained variance	70,10%	64,15%

Source: Developed by the authors (2023).

Table 4 below provides information on the Supervision Index of the Regional Education Directorate (ISRSD), along with its respective statistical information.

Table 4 - Items composing the Supervision Index of the Regional Education Directorate

Items	Espírito Santo	Piauí
Is available when you need them	0,794	0,745
Is aware of what is happening in this school	0,864	0,727
Systematically monitors the achievement of goals defined for this school	0,858	0,848
Evaluates the performance of the principals of the schools under its responsibility	0,923	0,879
KMO	0,811	0,670
Cronbach's Alpha	0,881	0,814
% of explained variance	74,14%	64,37%

Source: Developed by the authors (2023).

The rationale for selecting these items, as well as for composing two indices (instead of just one) related to the director's perception of regional support, was based on the results of the exploratory factor analysis (which resulted in two well-defined factors for the two states). We also considered the contribution of Leithwood and Jantzi's (2008) research, which suggests that the supportive functions of higher instances are more correlated with managers' self-efficacy than control functions.

Regarding the decision to focus exclusively on the director's perception of regional support (although there are items on this aspect in the CPs questionnaire), this is justified by the normative contexts of the states, in which the director is designated as the main point of contact with the regionals, a reality that is consistently reflected in empirical data.

Antecedents of Pedagogical Self-Efficacy of Teachers and School Managers

To examine the antecedents of teachers' pedagogical self-efficacy, we analyzed the correlations between the IAEPF and variables²¹ of the school's average socioeconomic level, years of teaching experience, and employment status (whether tenured or contracted). For Espírito Santo, the results indicate a negative (-0.071) but not significant ($p=0.064$) relationship with the average socioeconomic level of the school; a positive relationship (0.13) but not significant ($p=0.713$) for teaching experience, and a negative (-0.158) and significant ($p = 0.000$) relationship for being tenured.

Regarding Piauí, a significant negative relationship (-0.088) was found with the average socioeconomic level of the school ($p=0.029$); a significant negative relationship (-0.126) with teaching experience ($p=0.002$), and a significant negative relationship (-0.142) for being tenured ($p = 0.000$). Despite being counterintuitive, this result is in line with some research reporting higher levels of self-efficacy among directors of schools with higher vulnerability (Guerreiro-Casanova; Azzi; Russo, 2014).

To examine the antecedents of directors' pedagogical self-efficacy, we analyzed the correlations between the IAEPD and variables of the school's average socioeconomic level, number of teachers in the school, regional support index, and regional supervision index. We found a significant and positive correlation between the IAEPD and the number of teachers in the school, contradicting some previous national studies that suggested a higher level of self-efficacy among managers in schools in the early years of elementary education with fewer teachers and smaller classes (Casanova; Russo, 2016). This may contribute to the hypothesis that, in the later years of elementary education and in high school, larger schools with more resources contribute to higher self-efficacy among directors.

No significant values were found for the correlation between the SES of schools and the regional support and supervision indices. However, with a less stringent interpretation of significance values (expanding the acceptable level of significance from 0.05 to 0.1), it can be asserted that there is a positive correlation (0.231) between the regional support index and the pedagogical self-efficacy of directors in ES. The supervision index remains non-significant but in the same direction and with a smaller correlation.

²¹ We chose not to focus on sociodemographic variables (such as race, gender, and age) given the limitations of this article and the accumulated evidence in the literature that these variables are rarely associated with self-efficacy.

In Piauí, expanding the significance parameter, the results become significant for the regional supervision index, with a positive correlation (0.211) with the level of pedagogical self-efficacy of directors. The support index remains non-significant but in the same direction and with a smaller correlation. Given the literature's emphasis on the support of higher instances for managers' self-efficacy (Leithwood; Jantzi, 2008), we deem it relevant to report these results and recommend further studies focusing on this aspect in the future.

In examining the factors influencing the level of pedagogical self-efficacy of coordinators, the results for the correlation with socioeconomic level were non-significant for both states. Regarding the number of teachers in the school, we found a significant and positive correlation of 0.289 with the IAEPD in Piauí only. The discrepancy in results for pedagogical coordination between Piauí and Espírito Santo may be explained, among other factors, by differences in management arrangements, requirements for accessing the position, and the employment contract of these professionals (in Piauí, 73.4% are tenured, while in Espírito Santo, 56.6% are tenured).

As described in the "normative context" section, in part-time schools in Espírito Santo (64 schools, 91.4% of our sample), professionals performing pedagogical coordination tasks are called "pedagogues" (even though they share pedagogical leadership with area coordinator teachers), have mandatory minimum education in Pedagogy, may be tenured or temporary, and are not formally hierarchically positioned relative to teachers. In Piauí, on the other hand, pedagogical coordinators may have a degree in any area (with only 29 or 36.7% of professionals in our sample holding a degree in Pedagogy), are permanent professionals, and are formally placed in a hierarchically superior position to teachers.

Given this scenario, an interpretative hypothesis for the difference in significance between Piauí and Espírito Santo regarding the correlation between IAEPD and the number of teachers could be that, in the former state, coordinators may feel more confident in coordinating the work of specialist teachers since they themselves are licensed, have exclusivity in this assignment (shared only with the director), and hold a formally higher hierarchical position. Conversely, in Espírito Santo, pedagogues may feel less confident in dealing with the teaching staff because they are not specialists, share this function with area coordinator teachers, are not formally hierarchically superior to teachers, and, furthermore, may still be temporary.

Relationship between Teachers' and Managers' Pedagogical Self-Efficacy and Student Outcomes

Relationship between Teachers' Pedagogical Self-Efficacy and Student Outcomes

Based on the literature and the study of the normative contexts of the school networks, we proposed a regression²² model to test the hypothesis that self-efficacy indices would have some impact on the performance in mathematics of 3rd-grade high school students when controlled for variables such as the average socioeconomic level of schools, school size (measured by number of enrollments and segments offered), teaching experience, and type of contract (permanent or temporary). As the dependent variable, we tested the average performance in mathematics of students in the 3rd grade of high school.

We did not find significant results for the relationship between IAEP and student performance in either state (effect of 0.272 and significance of 0.760 in Espírito Santo; effect of -0.755 and significance of 0.216 in Piauí). Teacher experience and type of contract also did not show a significant correlation with performance. One explanatory hypothesis could be the small number of schools participating in PGLQE.

Relationship between Pedagogical Coordinators' Pedagogical Self-Efficacy and Student Outcomes

Regarding the relationship between pedagogical coordinators' pedagogical self-efficacy and student outcomes, we proposed a model that took into account variables such as the average socioeconomic level of schools, segments offered, and number of enrollments. We did not find significant results for student performance in the sample from Espírito Santo (effect of -1.80 and significance of 0.518 for IAEP). For the sample from Piauí, we found a significant correlation between the pedagogical coordinators' pedagogical self-efficacy index (effect of 4.258 and significance of 0.017²³) and the socioeconomic level of schools (effect of 23.731 and significance of 0.000). These results seem to corroborate the hypotheses about the work of pedagogical coordination in the two states described in the previous section.

²² Multiple Linear Regression is a type of statistical analysis that aims to establish a relationship between a dependent variable (in the case of this work, performance in mathematics) and other independent (contextual) variables. The resulting analysis can indicate how this relationship is associated and whether it is significant.

²³ Reading this result is that there is a 98.3% probability that the result found in this sample reflects the population scenario and that an increase of one unit in the pedagogical self-efficacy of pedagogical coordinators implies an increase of approximately 4.258 points in performance in math.

Relationship between Directors' Pedagogical Self-Efficacy and Student Outcomes

For the study of the relationship between directors' self-efficacy and student outcomes, we proposed, as independent variables, in addition to IAEPD, the school's socioeconomic level indicator, number of enrollments, number of segments offered, number of teachers, the regional support index, and the regional supervision index.

We did not find significant results for the correlation between IAEPD and student performance in either state (effect of -0.777 and significance of 0.701 in Piauí and effect of 1.890 and significance of 0.520 in Espírito Santo). This result is consistent with studies conducted in Brazil that did not find significant results for small samples (Guerreiro-Casanova; Azzi, 2012), or found significant but small positive effects for Brazil and Rio de Janeiro samples in the 9th grade based on SAEB 2019 data (Gino, 2023).

Given that management influences student learning indirectly, through effects on teaching work, and since no significant results were found for the relationship between teacher AEP and student performance, these results were expected. Also, no significant results were found for the other independent variables, except for socioeconomic level in Piauí, where the effect was 23.643 at a significance level of 0.000. The limited variation in socioeconomic level among the samples of schools in Espírito Santo (standard deviation of 0.24) may explain the lack of significance of this index for student outcomes in this state.

Analysis of Collective Pedagogical Self-Efficacy in Schools

To approximate the concept of collective self-efficacy, as described in the literature (Leithwood; Jantzi, 2008), we proposed an exercise of combining the self-efficacy indices of the three studied school actors. Our hypothesis suggests that there is a tendency for homogeneity among the self-efficacy indices of these actors within schools, that is, schools with high indices for all three actors or low index for all three actors. This conjecture is based on the literature, which points to the greater influence of context than of personal characteristics on levels of self-efficacy, as well as the impact of managers' self-efficacy on their practices and the performance of teachers.

To do this, we first categorized the three average pedagogical self-efficacy indices of schools (IAEPP, IAEPD, and IAEPD) into three levels: low, medium, and high, according to

the position of schools in the terciles of the distribution²⁴. Then, we constructed a matrix that made it possible to visualize these combinations and propose a classification of schools into four types, which is presented in Table 5.

Table 5 – Matrix of categorization of pedagogical self-efficacy of school agents²⁵

	Piauí	Espírito Santo
High self-efficacy of all 3 agents	3	5
High self-efficacy of teachers AND high self-efficacy of coordinators or directors	13	13
Low self-efficacy of teachers AND high self-efficacy of coordinators or directors	10	17
Low self-efficacy of all 3 agents	1	3

Source: Authors' own elaboration (2023).

Discussion and Conclusion

In this article, we sought to contribute to the understanding of the pedagogical self-efficacy beliefs of three school actors, teachers, pedagogical coordinators, and directors, investigating factors that influence or precede them (especially contextual ones) and their relationship with student performance. We also proposed an exercise of combining the beliefs of these various actors from the perspective of a configuration of collective pedagogical efficacy in schools.

As the main results of the background study, it was found that 1) experience and educational background variables show no correlation with the self-efficacy indices of the actors, corroborating previous findings in national and international literature; 2) the type of employment contract (contracted or temporary) demonstrated a negative influence on tenured teachers. This discovery requires further investigation in future research and may suggest the hypothesis of a socially desirable response from contracted teachers. Possibly, these teachers are more concerned with demonstrating pedagogical efficacy than their tenured colleagues, whose job security is not at risk; 3) the socioeconomic level of schools presents a negative correlation with the pedagogical self-efficacy of teachers in Piauí, i.e., the higher the SES, the lower the IAEP. Additionally, this correlation is also observed with the IAEP only in Piauí. This variation in results according to the educational network highlights the importance of

²⁴ In the base of coordinators from both states and in the base of directors in Piauí, it was not possible to organize three quantitatively similar groups due to many schools presenting the same index.

²⁵ Considering the possible combinations between the three levels established for each of the school agents (high, medium, and low self-efficacy), we summarized those that are most closely related to the present research into 4 categories.

considering each region's specific normative and socioeconomic contexts. Furthermore, the relevance of school size, expressed by the number of teachers and students, is emphasized in both contexts.

In this sense, in the case of pedagogical self-efficacy, it would indicate that larger schools, although certainly more complex, may offer more conditions for coordinating pedagogical action from the perspective of managers; 4) the support index from regional authorities does not show a significant correlation with the pedagogical self-efficacy indices of directors at a reliability level usually considered at 0.05. However, if we expand the significance threshold to consider 0.1 as an acceptable level of significance, it is possible to affirm that there is a positive correlation (of 0.231) between the regional support index and the pedagogical self-efficacy of the director in ES.

In Piauí, the support index remains with non-significant values, but in the same direction and with a lower correlation; 5) the regional supervision index, even when expanding the significance threshold, remains with non-significant values, but in the same direction and with a lower correlation in ES, but in Piauí, the results become significant with a positive correlation (of 0.211) with the level of pedagogical self-efficacy of the directors. Regarding the support and regional supervision indices, the results suggest that regional support may have a more significant influence on the pedagogical self-efficacy of directors than control or supervision. This finding can provide valuable insights for the development of new research focused on educational management in educational networks.

For the study regarding the relationship with student performance, we found that: 1) the pedagogical self-efficacy indices of teachers and managers were not associated with any of the student performance measures (average proficiency of 3rd-grade high school students in mathematics). The only index that appeared with a significant correlation was that of pedagogical coordinators in Piauí. Regarding the combination of the self-efficacy indices of the actors into an approximate measure of collective self-efficacy, we found that only 8 schools in the sample had homogeneity among all three self-efficacy indices (all low or all high), which contradicts our initial hypothesis of greater convergence of measures.

These results partially confirm the findings of national and international literature. One possible explanation for this deviation in results is the small sample size, especially in the case of directors and pedagogical coordinators (and consequently for schools, 139 in total, with 70 in ES and 69 in PI). For a more comprehensive understanding of these results, we recommend

the replication of these analyses in new samples, especially regarding the relationship between the self-efficacy indices of these actors and student outcomes.

This should also include an investigation into the possible impact of increasing inequalities, as highlighted by Gino (2023), as well as exploring the relationship between support from higher authorities to schools and the pedagogical self-efficacy beliefs of the school actors. Furthermore, we emphasize the importance of deepening the theoretical and empirical study of the concept of collective self-efficacy, suggesting the inclusion of specific items in the data collection instruments of future research to better operationalize it.

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