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## Observed classroom quality in first grade: associations with teacher, classroom, and school characteristics

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**Abstract** The observation and assessment of quality of teacher–child interactions in elementary school settings are increasingly recognized as important; however, research is still very limited in European countries. In this study, we examined the quality of the interactions between teacher and children in first-grade classrooms in Portugal and the extent to which structural features at teacher-, classroom-, and school-level explained variation in this quality. One hundred fifteen classrooms participated in the study. Classrooms were observed through a standardized rating scale concerning emotional, organizational, and instructional support. Results indicated that the levels of emotional and organizational support in most classrooms were of moderate quality, but the levels of instructional support were low, suggesting that most observed activities did not encourage students' higher-order thinking skills. An examination of the associations between teacher and classroom characteristics and the quality of teacher–child interactions indicated a small effect for teacher education. Teachers with an advanced degree were more likely to be more emotionally sensitive and to have better instructional interactions in the classroom. For school-level characteristics, findings showed that the classrooms in private and smaller schools were likely to provide higher levels of emotional, organizational, and instructional quality. The results suggest that focusing on the interactions between teacher and children can provide valuable information to enhance classroom quality.

**Keywords** Classroom quality · Associations · Teacher · Classroom · School characteristics

Over the past decades, most European governments have invested heavily in improving the quality and efficiency of education and training (Ministério da Educação [ME] 2006). Major changes have taken place targeting in particular the elementary school, based on extensive

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evidence linking early school skills to later school success (Duncan et al. 2007; Pianta and McCoy 1997). As investment in elementary school quality is increasing, there is considerable interest in investigating the structural and process components of classrooms and schools associated with children's school success. In particular, information about teachers' typical behaviors and children's learning experiences in early elementary classrooms can provide important information of the current state of each country's education system and is useful for discussions of the determinants that increase the likelihood of school success. In this study, we describe features of first-grade classrooms in Portugal and investigate the ways in which school, classroom, and teacher characteristics may contribute to the quality of experiences in the classroom.

## Defining classroom quality

While there are a variety of perspectives conceptualizing and measuring classroom quality, based on extensive literature on early child care, it has been increasingly accepted that classroom quality in preschool and early elementary school comprises two broad features: structural and process ones (Cryer et al. 1999; Gamelas 2003; Mashburn 2008; Pianta 2003). Structural features refer to regulatable aspects as well as aspects targeted by financing, such as teacher qualifications, teacher experience, class size, adult-child ratio, and type of curriculum (Cryer 1999; Howes et al. 2008; Kontos et al. 2002; Mashburn 2008). Process features refer to those aspects of the classroom that children experience directly (Cryer 1999; Cryer et al. 1999). Examples of classroom processes include social and instructional interactions among teachers and children, the type of activities and materials available for children, and everyday routines (Cryer 1999; Cryer et al. 1999; Kontos et al. 2002; Locasale-Crouch et al. 2007; Mashburn 2008). The structural features are viewed as providing the conditions for the processes that children directly experience (Cryer 1999; Cryer et al. 1999). For example, it is posited that, when teachers work in safe and orderly environments, they are more likely to be responsive and sensitive (Gamelas 2003). The structural features are viewed as prerequisite, although they are not sufficient to determine overall quality. In fact, more recently, the process features, namely, the interactions between teachers and children, are increasingly viewed as better predictors of student learning (Early et al. 2007; Howes et al. 2008). Specifically, the critical role of classroom interactions on improving children's achievement has been pointed out in a number of studies, with results indicating that high-quality teacher-child interactions are associated with improvements in both academic and socio-emotional skills (Curby et al. 2009; Hamre and Pianta 2005; Perry et al. 2007; Pianta et al. 2008b; Ponitz et al. 2009). Given these findings, descriptions of classroom quality and its predictors can provide important information to advance discussions on how to improve the learning experiences for children. However, in contrast with the research on early child care, particularly in South European countries, only a limited amount of research has assessed overall levels of classroom quality in early elementary schools, calling for more studies on this area.

## Structural features

Portuguese policy standards, like in other countries, regulate classroom quality from a top-down perspective centered on structural features (ME 1998). These features include, among





others, teacher qualifications, adult–child ratios, and curriculum. In the specific case of Portugal, teachers need to hold a certification on elementary school, and class sizes are limited to 25 students. Furthermore, the school curriculum is determined at national level and regulated by the Ministry of Education. The goals set are framed in broad terms and based on a comprehensive view of child development including foundational cognitive, social, and emotional skills, as well as active citizenship (ME 2004, 2006). The use of varying teaching strategies and methods is emphasized, although opportunities for active, meaningful learning are highlighted (ME 2004). A greater emphasis has been recently placed on critical thinking and problem-solving skills, as well as on autonomy and self-regulation (ME 2005).

Substantial changes in the compulsory education system have been recently undertaken as a result of increasing demands to raise the educational levels (Flores 2005; ME 2006). In 2001, the curriculum was reorganized, aimed at improving curriculum articulation across the school years and more clearly defining core competencies (Decreto Lei 6/2001). New programs for Portuguese language and mathematics have been developed, along with professional development and the release of several materials (Ponte et al. 2007; Reis et al. 2009; Serrazina et al. 2005). Although school sizes are not subject to standards and vary greatly, small elementary schools have been closed with children transferred to larger schools. Noteworthy is the fact that, although much has changed in Portugal, at present, there are no formal procedures for monitoring classroom processes. This fact limits the ability to determine the extent to which the changes introduced are actually improving the experiences offered to students and stresses the need for conducting studies that investigate structural and process quality features in elementary school. In this study, we examine features at teacher-, classroom-, and school-level.

Teacher structural features: Parallel to educational policy, research on early childhood and elementary school has examined whether different structural features at teacher-level are linked to classroom process features. Research from the early childhood education literature suggests that teachers with a formal college degree are likely to provide higher quality learning experiences for children (Burchinal et al. 2002a, b; Fukkink and Lont 2007; Phillipsen et al. 1997). In kindergarten and elementary classrooms, though, the associations of teacher characteristics with classroom quality are not as consistent (LoCasale-Crouch et al. 2007; Pianta et al. 2002; Pianta et al. 2005). For example, in the United States, recent findings from kindergarten classrooms indicated a significant association between advanced degree status and higher levels of instructional support (La Paro et al. 2009). Specifically, teachers with master's degree or higher were more likely to stimulate children's problem-solving abilities and to provide sustained feedback. In another study involving kindergarten classrooms, however, Pianta et al. (2002) found that teacher education and experience were unrelated to classroom quality. In first grade, years of post-high school education showed statistically significant associations with the observed classroom quality, but they were very small in magnitude (Connor et al. 2005; Maxwell et al. 2001; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network 2002). Teachers' total years of experience were not associated with either emotional or instructional classroom quality, although a significant but modest association was found between years of experience teaching first grade and time devoted to academic activities. Findings from third-grade classrooms (NICHD Early Child Care Research Network 2005) and fifth grade (Pianta et al. 2008a) were similar, indicating that teacher factors were not related to observations of classroom quality. In a study involving Austrian, German, and Spanish elementary school classrooms, it was found that teacher characteristics such as number of years as a teacher were weakly predictive of process quality (European Child Care and Education [ECCE]

Study Group 1999). Taken together, available evidence indicates that variation in the quality of classroom interactions in early elementary grades is not accounted for by teacher experience and very little for teacher education (NICHD Early Child Care Research Network 2002, 2004; Pianta et al. 2008a).

Classroom structural features: Regarding class size, there is a body of research examining the effects of class size on student achievement, but the evidence has not been conclusive (Cohen et al. 2003; Goldstein et al. 2000; Rutter and Maughan 2002). In the UK, in a series of studies, Blatchford et al. (2003, 2005, 2002) showed that, in smaller classes, teacher–child contacts were more frequent and personalized, teachers spent more task time with students, and classroom management was easier for teachers. However, in the United States, Milesi and Gamoran (2006), based on nationally representative data, examined the associations between class size, instructional practices, and student achievement at the kindergarten level and found only few associations between class size and instructional practices. In their review, Rutter and Maughan (2002) noted that very small classes, below 15 students, can be beneficial, but variation in class size between 25 and 35 students exert little effect on achievement. Possible reasons that have been advanced for associations between class size and student achievement include differences in resource use and greater opportunities for improvements in classroom processes, such as more individualized instruction (Cohen et al. 2003; Pedder 2006; Rutter and Maughan 2002). But research examining the associations between class size and observed classroom quality has shown that these associations, if any, were small in magnitude. In a recent study conducted in kindergarten, La Paro et al. (2009) found that smaller child–teacher ratios were related to higher quality of classroom interactions. In elementary school classrooms, large-scale studies from the NICHD Early Child Care Research Network (2002; 2005; Pianta et al. 2008a) indicated that the quality of classroom interactions was not associated with class size or child–teacher ratio. Similarly, class size was not a significant predictor of observed developmentally appropriate practices across early grades both in the United States and in some other European countries, such as Austria, Germany, and Spain (ECCE Study Group 1999; Maxwell et al. 2001). In sum, like teacher education and experience, the literature on the associations between class size and classroom process quality is mixed and suggest inconsistent associations. It seems nevertheless important to further examine these associations in Portugal, because specific contextual features can contribute to differences in these associations and considering the surprising dearth of studies conducted in countries such as Portugal. In addition, we included in our study both teacher characteristics and class size because we wanted to investigate the contribution of each structural feature over and above the contribution of the other structural features. In particular, it seemed to us especially relevant to investigate school-level structural predictors. The extent to which predictors at school level are related to classroom quality has received considerably less attention. The importance of school-level variables, however, should not be ignored, as these more distant variables may also influence teacher–child classroom interactions (ECCE Study Group 1999; O’Brien and Pianta 2010; Rutter and Maughan 2002).

School characteristics: One structural factor at school level that can be associated with classroom quality is the school size. Variation in school size can represent great variation in the available resources, including facilities, material, and teacher resources and, thus, can influence classroom interactions. Larger schools have been justified on the basis of greater economic efficiency and increased resources such as curricular offerings to students (Leithwood and Jantzi 2009; Slate and Jones 2005). Cotton (1996), however, based on earlier school size research, pointed out that smaller schools produce better academic results and provide a better school climate. In a recent review of school size effects in elementary

and secondary schools in the United States, Leitwood and Jantzi (2009) reported that smaller schools were generally better in a considerable number of student and organizational outcomes. Smaller school sizes were positively related to greater student achievement, lower dropout rates, stronger student engagement, and more positive teacher attitudes towards their work. The authors concluded that empirical evidence favors smaller school sizes, challenging the widespread notion that larger schools are better due to the variety of resources available (Leitwood and Jantzi 2009). The number of studies examining elementary schools was limited, however. Moreover, none of the reviewed studies addressed the associations between school size and variables at classroom level, such as teacher–child interactions.

The extent to which public and private schools might differ in classroom quality seems also important to acknowledge. A number of explanations can be offered for possible differences between public and private schools, including differences in student and parental characteristics (e.g., parental education), differences in school financial resources and facilities, or differences in the school composition (Dronkers and Avram 2010; Sullivan and Heath 2002). Research in various countries, namely Belgium, France, and the United States, has examined sector differences in student achievement with evidence suggesting that private school students have higher educational outcomes than public school students (Hoffer 1998; Toma 1996). However, these findings have been recently challenged by studies showing that public schools performed at an equal level, once student demographics is taken into account (Carbonaro 2006; Lubienski et al. 2008). More recently, Dronkers and Avram (2010) examined the potential effect of school sector across 25 countries including Portugal. Findings indicated that private school students had higher readings scores in nearly all countries, but these differences were no longer statistically significant once appropriate controls were introduced. These controls included not only student background and school composition but also other confounding factors at school level. Possible differences along school dimensions in school sector have been recently examined. In the United States, findings from one study (Carbonaro 2006) revealed that private school kindergarten classrooms were more likely to have smaller class sizes and cover more curriculum content, but public school kindergarten classrooms were more likely to make greater use of instructional time. In the above-mentioned studies, data on learning opportunities were self-reported by teachers, though. There are very few studies that have used observation methods to assess classroom quality. In one exception, O'Brien and Pianta (2010), using observational data, compared the quality of emotional and instructional quality from public first and third grade classrooms with those from private schools. Findings showed that instructional quality in the classrooms was higher in public schools, both in first and third grades. These findings suggest that public schools may provide higher-quality classroom interactions in the United States, but clearly more research is needed.

### Process features of quality

To assess classroom process quality, observational methods and, in particular, high-inference measures, have been increasingly used (e.g., Hamre and Pianta 2005; Perry et al. 2007). The advantage of high-inference measures is that several indicators can be considered simultaneously and thus can be more representative of children's experience in the classroom (Curby et al. 2009; Hamre et al. 2009). One observational measure of the quality of teacher–child interaction in classrooms that has received empirical validation is the Classroom Assessment Scoring System (CLASS; Pianta et al. 2008b). The theoretical framework

for the CLASS is based on developmental theory and posits that the interactions that take place among teachers and children on a daily basis are the primary mechanisms through which children learn (Pianta and Hamre 2009). Specifically, three main domains of teacher–child interactions are identified as relevant to children’s learning: emotional, organizational, and instructional support (Curby et al. 2009; Hamre et al. 2007; La Paro et al. 2004). Emotional support involves teacher’s warmth and sensitivity toward children, and adaptation of the lessons and activities to support children’s expression of ideas (Pianta et al. 2008b; Pianta and Hamre 2009). Organizational support refers to teacher’s use of proactive approaches to behavior management, including monitoring student engagement, establishing predictable routines, and defining clear expectations (Pianta et al. 2008b; Rimm-Kaufman, Curby et al. 2009). It also refers to teacher’s productive use of time and materials to enhance children’s engagement in learning activities (Pianta et al. 2008b). Instructional support comprises teachers’ encouragement of analysis and reasoning, provision of scaffolding and additional explanations, and engagement in meaningful conversations with children (Hamre et al. 2007; La Paro et al. 2004; Pianta et al. 2008b; Pianta and Hamre 2009). Findings have shown that high levels of emotional, organizational, and instructional support, as assessed by the CLASS, are associated with academic achievement and social performance at the end of preschool and first grade (Curby et al. 2009; La Paro et al. 2004; Ponitz et al. 2009; Rimm-Kaufman et al. 2009), including in Portugal (Cadima et al. 2010). In addition, because it addresses both emotional and instructional features of the classroom, this innovative framework seems to be more comprehensive than other models of classroom quality (Hamre et al. 2007). In this study, we have used this observational measure to assess and describe the quality of teacher–child interactions.

In sum, examining the emotional, organizational, and instructional features of classroom interactions deserves further study because, at present, little is known about the actual activities and experiences provided within classrooms in European countries (Eurydice 2009; ME/GAVE 2001). Indicators of school quality in Europe usually include students’ results in comparative studies and teacher reports, thus providing little information regarding teaching strategies and practices in the context of classroom. Despite substantial changes in the compulsory education system across several countries including Portugal, there are few studies that provide clear descriptions of the actual ways in which teachers interact with children within classrooms in European countries, restricting our understanding about how teachers are translating policy initiatives into classroom practices. Furthermore, the use of observational measures with adequate reliability and validity, as the experience in other countries has shown, may inform the debate over how to increase school success. Conducting studies in countries such as Portugal can help understand whether existing measures and models of classroom processes can be generalized across different socio-cultural contexts. In addition, the research may be helpful in characterizing, for the first time, what types of classroom interactions and experiences are provided to children in Portuguese first-grade classrooms.

It is also important to determine whether features under regulatory control and, thus, considered relevant for teaching and learning, are related to classroom quality in the Portuguese context. For example, are teachers with an advanced degree more likely to have higher-quality interactions in the classroom? This has clear implications for educational policy, and it is particularly relevant in Portugal, where the number of available studies is very limited. In addition, it is important to include other factors that might contribute to classroom quality and have been far less studied. In this study, we extend previous research by including school-level factors.

## The present study

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The present study aims to investigate the quality of classroom interactions and determine the extent to which teacher, classroom, and school characteristics explain variation in the quality of classroom interactions in Portugal. The following research questions are addressed: (a) What is the quality of classroom interactions in terms of emotional, organizational, and instructional dimensions? (b) To what extent are structural features (e.g., teacher education, school size) associated with higher quality of classroom interactions? Following a comprehensive model of quality used in previous research (Eccles and Roeser 1999; Pianta et al. 2005) in which schools are viewed as complex systems that comprise predictors nested within different levels, we include teacher characteristics (teacher education and experience), classroom characteristics (class size), and school characteristics (public versus private, school size, school composition) as structural predictors. We especially are interested in determining whether school characteristics are linked to the quality of classroom interactions after controlling for other classroom and teacher characteristics, because (1) far fewer studies have examined these links, and (2) school characteristics are not under regulation and have not been subject to standards, although features at school level such as school size have been recently changed by the Ministry of Education.

## Method

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### Participants

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Participants in this study were 115 first-grade classrooms and respective teachers. Two groups of classrooms were selected based on two cohorts of children participating in a larger research project conducted in the Metropolitan Area of Porto. The Metropolitan Area of Porto is the second biggest urban area in Portugal, with a population of nearly one half million. This area is highly industrialized, with one third of the population working in this sector. Similar to national education levels, in 2005, the mean level of maternal education was 9.6 years (Câmara Municipal do Porto/Gabinete de Estudos e Planeamento 2008). The research project, *Contexts and Transition*, was designed to examine the quality of preschool classrooms and its effects on children's academic and social performance. For this larger project, a cluster random sampling was used in which preschool classrooms were randomly selected followed by the random selection of preschool children. Children were followed into their entry to first grade. In 2006/2007, all first-grade classrooms attended by participant children were recruited, for a total of 76. Of these classrooms, consents from teachers were obtained in 73 classrooms (96 %). In 2007/2008, all the first-grade classrooms attended by the second cohort of children were recruited, for a total of 43. Of these classrooms, 42 (98 %) of the teachers agreed to participate.

All teachers held a professional certificate in Elementary Education. Almost all teachers attended a 3- or 5-year course in a university or polytechnic institute and held respectively, a bachelor or *licenciatura* degree (90.3 %); the others held a Post-graduation or a Master Degree. The teachers varied widely in the years of teaching experience ( $M=16$  years, range=1–37 years). Classrooms had, on average, 21 children. The total 115 classrooms were from 99 schools. Most schools had one participating classroom (86 %); 11 % had two participating classrooms; one school had three participating classrooms and one other four participating classrooms. Almost all schools were public (91.3 %). School size ranged from 38 to 660 pupils, and nearly half of the schools serve children from medium socioeconomic status families. Descriptive information used in the regression analyses is provided in Table 1.



**Table 1** Descriptive statistics for structural characteristics (N=115)

	<i>n</i> (%)	M	SD	Min	Max
Teacher characteristics					
Teacher years of experience		16.11	10.17	1	37
Teacher's education level					
% Bachelor's or graduation degree	102 (90.3 %)				
% Post-graduated or higher degree	11 (9.7 %)				
Classroom characteristics					
Class size		20.92	3.35	10	26
School characteristics					
Public	89 (89.9 %)				
Private	10 (10.1 %)				
School size		172.7	121.9	38	660
School>low SES range	13 (14.0 %)				
School>low-medium SES range	27 (29.0 %)				
School>medium SES range	42 (45.2 %)				
School>medium-high SES range	9 (9.7 %)				
School>high SES range	2 (2.2 %)				

In Portugal, elementary school, the first cycle of basic education, includes 4 years. First grade is the first year of elementary school, starting at age 6, and teachers usually follow the same group of children from the first to the fourth grade. It is a common practice for schools to choose a commercially published workbook for each subject area. The school system is predominantly public, and, in general, schools serve local communities, and therefore children who attend school live nearby.

## Measures

*Observed classroom quality* The Classroom Assessment Scoring System (CLASS; Pianta et al. 2006) was used to measure the quality of interactions among teachers and children in classrooms. Observers scored classrooms on a seven-point Likert scale from low (1, 2), middle (3, 4, 5) to high (6, 7) on nine dimensions, described next, within three major domains: emotional support, classroom organization, and instructional support.

*Emotional support* Three dimensions were used to assess emotional support: positive climate, teacher sensitivity, and regard for student perspectives. Positive climate considers the overall emotional tone and the emotional connection between teachers and children (e.g., laughing, smiling). Teacher sensitivity considers teachers' awareness of children's academic and emotional needs. Regard for student perspectives reflects the degree to which teachers place an emphasis on students' interests, motivations, and points of view.

*Classroom organization* Three dimensions are used to assess classroom organization: behavior management, productivity, and instructional learning formats. Behavior management considers teachers' use of effective methods to monitor, prevent, and redirect misbehavior. Productivity considers how well teachers maximize time spent in learning activities (e.g., smooth transitions). Instructional learning formats reflect the degree to which teachers

facilitate activities and provide interesting materials to maximize children's engagement and ability to learn. 336  
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*Instructional support* Three dimensions are used to assess instructional support: concept development, quality of feedback, and language modeling. Concept development considers the degree to which instructional discussions and activities promote students' higher order thinking skills (e.g., asking "why" and "how" questions). Quality of feedback reflects the degree to which teachers' feedback extends children's learning and understanding (e.g., prompting additional exploration of the topic). Language modeling considers the use of language-stimulation and language-facilitation techniques (e.g., open-ended questions, mapping behavioral actions). 338  
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This observational measure has been developed in the USA, with several studies showing that the CLASS provides reliable, valid assessments (Curby et al. 2009; Hamre et al. 2007; Rimm-Kaufman et al. 2009). The CLASS has also been used in European countries, such as Finland (Pakarinen et al. 2010), Belgium (Buyse et al. 2008), and Portugal (Cadima et al. 2010). Factor analyses have been conducted in the USA, Finland, and Portugal and confirmed the three-factor solution (Cadima and Leal 2008; Hamre et al. 2007; Pakarinen et al. 2010; Pianta et al. 2008b). The confirmatory factor analysis with data from Portuguese classrooms, including the classrooms in this sample, indicated an acceptable fit of the three-factor model. Factor loadings exceeded 0.70, with the exception of one dimension, Behavior Management, which was 0.55, and correlations among dimensions were above 0.50. 346  
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*Training and interrater agreement* Prior to data collection in each year, the observers participated in training sessions in order to reach an interrater agreement of 80 %, which was met by all observers in both years. All observers were graduated in Psychology and had experience in data collection (respectively, four observers in 2006/2007 and three observers in 2007/2008). During data collection, 22 classrooms in 2006/2007 (30 % of the total) and 11 classrooms in 2007/2008 (26 %) were rated by two observers. Interrater agreement was adequate. Specifically, the mean weighted kappa was 0.78, ranging from 0.59 (concept development) and 0.88 (teacher sensitivity). On average, 99 % of data collector scores were within one scale-point of each other. For the present analysis, we computed average scores of the dimensions for three CLASS domains, with each achieving adequate levels of internal consistency, respectively, Emotional Support,  $\alpha=0.91$ , Classroom Organization,  $\alpha=0.79$ , and Instructional Support,  $\alpha=0.95$ . 356  
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*Teacher, classroom, and school characteristics* Data on teacher, classroom, and school characteristics were collected through a teacher questionnaire. This questionnaire was adapted from the version developed by Cryer et al. (1999) at their cross-national study. Teachers were asked several questions about teachers (teacher education and teacher experience), classroom (class size), and school characteristics (sector, school size, and school composition). The following variables were used in the analyses: 368  
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*Teacher education* Teachers' highest level of education was coded as follows: teachers holding a bachelor or 5-year degree (=0) and teachers holding Post-graduation or a Master degree (=1). 374  
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*Teacher experience* The total years of teaching experience was used in the analyses. 376

*Class size* The number of children enrolled in the classroom reported by the teacher was used in the analyses. 377  
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<i>School sector</i>	School sector was coded whether the school was private (=0) or public (=1).	379
<i>School size</i>	The total number of children enrolled in the school was used in the analyses.	380
<i>School composition</i>	From the teacher-reported percentages of students with different socio-economic status (low, low-medium, medium, medium-high, and high SES), a school SES variable was created, based on the median.	381 382 383
Procedure		384
	In 2006/2007, classrooms were observed by trained researchers for approximately 2 and ½h, starting at the beginning of the school day. Teachers completed the questionnaire at the end of the observation. In 2007/2008, the same procedure was used.	385 386 387
Data analysis		388
	First, we conducted descriptive analyses regarding the three domains of classroom quality. Second, a series of regression models were conducted to examine the extent to which characteristics of the teacher, of the classroom, and of the school predicted observed quality. Blocks of predictors were entered into the models in the following order: (a) in the first step, teacher characteristics (education, years of experience) were entered into the model; (b) in the second step, classroom features (class size) were added; and (c) in the last step, school features (sector, school size, and school demographic composition) were added to the model. This approach allows for computing the portion of variance in classroom quality that was accounted for by each block, and thus, an effect size can be reported for teacher-, classroom-, and school-level features. To account for possible bias, we included a dummy variable indicating whether the classroom data were collected in 2006/2007 or 2007/2008. As each block was entered into the model, contributions to prediction were examined for individual predictors, controlling for predictors entered previously. The predictors were entered into the models from most proximal to most distal in relation to the observed quality. They were entered in this order, because we were especially interested in examining the contributions of school-level features after controlling for the other classroom and teacher features. In the models, robust standard errors were computed to account for the nesting of classrooms within schools, and full information maximum likelihood estimation was used to address missingness. <i>Mplus</i> version 5.0 (Múthen and Múthen 1998–2007) was used to perform the analyses.	389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407
<b>Results</b>		408
	The results below provide descriptive information on the quality of classroom interactions in first grade classrooms. As shown in Table 2, for emotional support, the mean score was 4.06 (SD=1.05) on a seven-point scale, which was in the middle range. According to the CLASS measure, teachers were generally observed to have relatively warm, respectful relationships with children and to be aware of students who needed extra support. Classroom quality was in the moderate range for classroom organization, with a mean score of 4.20 (SD=0.99). Teachers were generally effective in preventing misbehavior and often provided clear activities for children, although only occasionally facilitated children's active engagement through the use of a variety of modalities and materials. The mean score of 3.06 (SD=1.15) for instructional support was also in the middle range, but ratings were much lower,	409 410 411 412 413 414 415 416 417 418



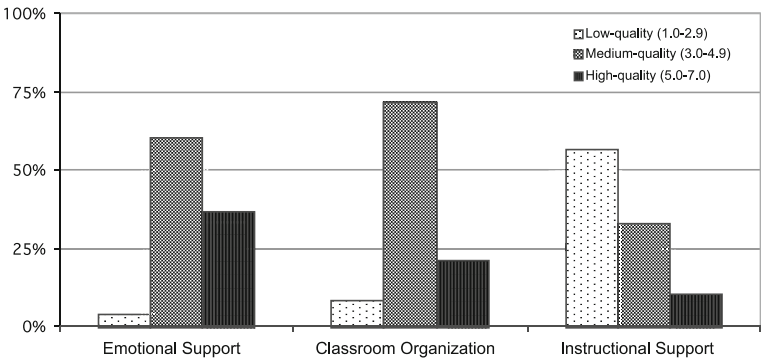
Observed classroom quality in first grade

**Table 2** Descriptive statistics for global classroom quality indicators (*N*=115)

		M	SD	Min	Max
t2.1					
t2.2					
t2.3	CLASS emotional support	4.06	1.05	1.92	6.58
t2.4	CLASS classroom organization	4.20	0.99	1.42	6.33
t2.5	CLASS instructional support	3.06	1.15	1.08	6.08

indicating that children were observed to be engaged in activities that focus mainly on recall skills, rather than on comprehension and thinking skills. Children received perfunctory feedback regarding their performance that focused mainly on correctness. In addition, few opportunities for children to engage in conversations were provided. Inspection of the results for three dimensions that are included in this domain showed low ratings for all of them, respectively, for concept development, quality of feedback, and language modeling, 2.91 (SD=1.28), 3.12 (SD=1.17), and 3.15 (SD=1.19). The range of scores indicated, nevertheless, that there was considerable variability across classrooms. Figure 1 shows the proportion of classrooms in the low, moderate, and high-quality range for each CLASS domain. Most classrooms were in the moderate range for emotional support and classroom organization, whereas most classrooms were in the low range for instructional support.

Table 3 reports correlations among structural features and the observed classroom quality. Associations among the three CLASS domains were strong and positive between emotional support and classroom organization,  $r=0.80$ , classroom organization and instructional support,  $r=0.80$ , and between emotional and instructional support,  $r=0.88$ . Teachers who were observed to be warmer and more responsive to students were also observed to manage activities more efficiently and productively, and to provide more often activities that encourage reasoning and expand language. The quality of emotional support was observed to be higher when teachers held an advanced degree,  $r=0.18$ , although the magnitude was small. The years of experience in teaching was not significantly related to the dimensions of classroom quality. The associations between classroom observed quality and class size were also not noteworthy. Classrooms within public schools were rated lower than private schools in all domains of the observed quality, and correlations were of moderate magnitude, emotional support,  $r=-0.33$ , classroom organization,  $r=-0.38$ , and instructional support,  $r=-0.26$ . School size was negatively associated with observed levels of emotional support,  $r=-0.21$ , classroom organization,  $r=-0.20$  and instructional support,  $r=-0.22$ . School composition was positively related to emotional support,



**Fig. 1** Percentage of classrooms rated at low-quality, medium-quality, and high-quality levels for CLASS dimensions

Table 3 Associations among structural and classroom quality indicators (N=115)

Table with 9 columns (1-8) and 9 rows (1-9). Rows 1-3 are CLASS domains. Rows 4-9 are structural indicators. Correlation coefficients are shown in the cells.

a 1=Post-graduated or Master's degree
b 1=Public
\*p<0.05, \*\*p<0.01

r=0.23 and classroom organization, r=0.26, indicating that classrooms in schools with more children with higher SES displayed higher levels of quality on these two CLASS domains. Public schools and higher school sizes were both moderately related to higher class sizes, r=-0.31 and r=0.31, respectively.

Regression analyses

To examine the associations of the structural characteristics on the observed classroom quality, regression analyses were conducted for each CLASS domain. The B coefficients, the standard errors, and the standardized betas are presented in Table 4. Teachers' years of experience and level of education were not significantly related to the classroom quality domains. The variance accounted for this block of variables was very small, 5 % for emotional support, 3 % for classroom organization, and 3 % for instructional support. Class size was not a noteworthy predictor, accounting for less than 1 % of the variance on the three CLASS domains. The school block, though, made significant and noteworthy contributions when added after teacher and classroom blocks, explaining 15 % of the variance on emotional support, 20 % on classroom organization, and 12 % on instructional support. Specifically, classroom emotional quality was observed to be higher when schools were private, beta=-0.28, p<.05, and smaller, beta=-0.20, p<0.05. Classrooms in both smaller and private schools were also rated as displaying more organized environments, beta=-0.35, p<0.05 and beta=-0.19, p<0.05, respectively, and as providing higher classroom instructional quality, beta=-0.26, p<0.05 and beta=-19, p<0.05.

It should be noted that, in the final model, when all predictors were entered and the effects were adjusted, teacher education showed statistically significant associations with emotional support and instructional support, beta=0.18, p<0.05 and beta=0.17, p<0.05, respectively. Teachers with an advanced degree were more likely to provide higher levels of emotional and instructional support.

Discussion

In this study, we intended to investigate the quality of classroom interactions and its associations with structural features in Portugal. We first examined the quality of classroom

**Table 4** Summary of regression analyses predicting process measures (*N*=115)

		Emotional support				Classroom organization				Instructional support			
		<i>B</i>	SE <i>B</i>	$\beta$	$R^2$	<i>B</i>	SE <i>B</i>	$\beta$	$R^2$	<i>B</i>	SE <i>B</i>	$\beta$	$R^2$
					0.05				0.03				0.03
	Year	0.11	0.21	0.05		0.26	0.22	0.13		0.04	0.24	-0.02	
	Teacher education <sup>a</sup>	0.64	0.36	0.18		0.41	0.28	0.12		0.62	0.37	0.16	
	Teacher experience	-0.01	0.01	-0.10		-0.00	0.01	-0.03		-0.00	0.01	-0.05	
					0.05				0.03				0.04
	Year	0.12	0.21	0.05		0.29	0.22	0.14		0.10	0.24	0.04	
	Teacher education <sup>a</sup>	0.64	0.36	0.18*	$\Delta R^2$	0.44	0.29	0.13	$\Delta R^2$	0.68	0.38	0.17	$\Delta R^2$
	Teacher experience	-0.01	0.01	-0.10	0.00	-0.00	0.01	-0.03	0.00	-0.00	0.01	-0.05	0.01
	Class size	-0.01	0.03	-0.02		-0.02	0.03	-0.06		-0.04	0.04	-0.10	
					0.20				0.23				0.16
	Year	-0.03	0.18	-0.01		0.14	0.18	0.07		-0.04	0.21	-0.02	
	Teacher education <sup>a</sup>	0.65	0.30	0.18*	$\Delta R^2$	0.44	0.25	0.14	$\Delta R^2$	0.68	0.34	0.17*	$\Delta R^2$
	Teacher experience	-0.00	0.01	-0.03	0.15	0.00	0.00	0.05	0.20	0.00	0.00	0.02	0.12
	Class size	-0.02	0.03	-0.05		-0.03	0.02	-0.11		-0.04	0.04	-0.05	
	School sector <sup>b</sup>	-1.06	0.39	-0.28*		0.33		-0.35*		-0.26*			
	School size	-0.01	0.00	-0.20*		-0.01	0.00	-0.19*		-0.01	0.00	-0.19*	
	School composition	0.16	0.12	0.14		0.15	0.11	0.14		0.13	0.13	0.10	

<sup>a</sup> 1=Post-graduated or Master's degree

<sup>b</sup> 1=Public

\**p*<0.05, \*\**p*<0.01

interactions in terms of emotional, organizational, and instructional dimensions. Findings indicate moderate levels of quality for emotional and organizational support but low levels for instructional support. Importantly, the results suggest that, in most observed classrooms, children are not experiencing the kind of instructional activities that research has shown to be critical for thinking skills and meaningful learning. There is a growing body of research showing that classroom interactions such as asking open-ended questions, encouraging problem solving and prediction, and providing scaffolding and sustained feedback are associated with children's learning (Hamre and Pianta 2005; NICHD Early Child Care Research Network 2002; 2004). Our results suggest that, in most classrooms, teachers are not providing this kind of support. In addition, despite the recent Portuguese curriculum guidelines emphasizing critical thinking and problem-solving (ME 2005), the current levels of instructional support observed in the majority of classrooms are not consistent with such guidelines. The mathematics program, for instance, clearly states the need for teachers to encourage children to reflect on their own thinking, to confront each other's ideas, or discuss alternative solutions when solving problems (Ponte et al. 2007). Thus, while improving the curricula is important, as these reform efforts do pose new challenges to teachers in terms of interaction patterns (Amado and Freire 2005), a direct focus on everyday classroom interactions can be useful to both understand and improve teacher practices. These findings are among the first to report observational evidence for Portuguese first-grade classrooms. In

comparing these findings with results from other countries, the levels of instructional support are similar to the ones from the USA but quite low when compared with Finland and Belgium (Buyse et al. 2008; Pakarinen et al. 2009; Pianta et al. 2008b).

We also intended to determine the extent to which (a) teacher characteristics (education, years of experience), (b) classroom features (class size), and (c) school structural features (school type, school size, and school composition) could explain variations in the quality of teacher–child classroom interactions. Findings suggest a statistically significant association between teacher education and both emotional and instructional support. Although the associations were very small, teacher education showed a positive, noteworthy association with emotional and instructional support. Teachers with an advanced degree, that is, holding at least a post-graduation degree, were more likely to be warm in their interactions with children and to provide more challenging and stimulating activities. Even if modest, this association suggests that teacher education may be a means to enhance quality. It is possible that advanced degree programs help teachers to develop and refine their skills to interact more effectively with children. It is also possible, however, that teachers who are more sensitive and intentional in their interactions also are more likely to seek an advanced educational level. Nevertheless, the contribution to total variance was very small. Moreover, the weak associations found and the correlational nature of data both prevent us from establishing convincing evidence for the role of teacher education in classroom process quality.

Overall, these results add to evidence from the United States and other countries in Europe suggesting that structural characteristics such as class size and teacher characteristics exert little influence on teachers' practices and interactions (ECCE Study Group 1999; NICHD Early Child Care Research Network 2002; Pianta et al. 2002). They are also consistent with Portuguese results for child care settings (Gamelas 2010).

One possible reason for the very small associations regarding teacher education is that the levels of education required for elementary school teaching are fairly high and restricted in range. The same explanation could be given regarding class size, with the limit set at 25 students per class. The lack of associations between teacher and classroom characteristics and observed classroom quality may therefore be a result of increasing regulation and consequent homogeneity of those characteristics rather than indicating its irrelevance. Nonetheless, there were important variations across classrooms that remained to be explained, which suggest the need to identify other potential factors likely to influence how teachers and children interact within classrooms.

An important feature of this study was the inclusion of school-level characteristics that, in contrast to teacher and classroom characteristics, appeared to be associated with the quality of classroom interactions. Variation among classrooms in the observed quality was associated with school sector and school size. Regarding school sector, recent research has shown that private and public schools differ along a number of dimensions, such as school climate, teacher education, class size, or the type of instruction (Carbonaro 2006; Lubienski et al. 2008). Our findings suggest that, even after controlling for some of these dimensions, namely teacher education and experience, class size, school size, and student demographics, there were still differences between private and public schools in all CLASS domains. It should be noted that we used a rough measure of school demographics and that a more fine-tuned one could yield different results. Regardless, these results suggest that sector differences seem indeed important for understanding variation in classroom quality.

School size was negatively related to global ratings of classroom quality. Smaller schools were more likely to be associated with higher levels of emotional, organizational, and instructional support. Research points to evidence favoring smaller schools in several

dimensions (Leithwood and Jantzi 2009), but the quality of interactions had not been previously examined. Our study extends this body of research, suggesting that smaller schools are associated with increased levels of classroom process quality. Possible reasons for these results are that smaller schools may have an effect on the social climate of schools, providing opportunities for closer interpersonal relationships among students and teachers, increased sense of community and parental involvement (Ahn and Brewer 2009). Smaller schools may also foster a culture of teacher collaboration and contribute to more positive attitudes about teachers' responsibility for students' learning (Lee and Loeb 2000; Leithwood and Jantzi 2009). Our results call attention to some potential drawbacks of larger schools. Importantly, recent Portuguese policies are changing the scale of schooling, with schools increasing in size and small schools being closed. Although further research is needed, these findings suggest that enlarging schools are likely to affect children's experiences in many aspects, not merely in terms of available resources.

Taken together, in this study, school characteristics such as school sector and school size were better predictors of classroom interactions than either teacher or classroom characteristics. Whereas teacher experience and class size were unrelated to classroom quality, classrooms in private and smaller schools were likely to provide higher levels of emotional, organizational, and instructional quality, possibly because these school features are not regulated as strictly as classroom and teacher characteristics. These findings are relevant as they suggest that school-level structural features are important for classroom-level processes and deserve further attention.

## Limitations

When considering the results of the present study, some limitations should be noted. First, participants in this study were from one region of Portugal, the Metropolitan Area of Porto, which limits the generalizability of findings across regions. We should mention that, to our knowledge, it is the first study in Portugal involving first-grade classrooms, and clearly more research is needed. Second, the most of the participating schools have one participating classroom; although the coefficients from our models are not biased, it would be important to include more classrooms per school so that we could better understand the variability of classroom quality both at class and school level. Third, one should acknowledge the correlational nature of our findings, and thus, causal links cannot be inferred.

## Conclusion

The current study adds to the body of knowledge evidence documenting the quality of students' experiences in first-grade classrooms. Taken as whole, our findings suggest that teacher and classroom features currently under regulatory control exert little influence on classroom quality. Given the variability found among classrooms and, in particular, the low levels for instructional support, our findings suggest that these regulable features, even if necessary, are not sufficient to ensure appropriate levels of quality on these dimensions. Classrooms might meet all structural requirements, such as teacher education and adequate class size, but fail to provide appropriate levels of emotional, organizational, and instructional quality. In order to regulate and optimize children's experiences in the classroom, given previous research showing associations between teacher-child interactions and child outcomes (Curby et al. 2009; Hamre et al. 2007; Rimm-Kaufman et al. 2009), including in Portugal (Cadima et al. 2010), it may be important to focus directly on the classroom

interactions. For example, Howes et al. (2008) suggested that to better support children's learning, focusing on classroom processes could be more effective rather than simply specifying structural indicators. Although further research is needed, in particular to identify factors that might affect the quality of experiences provided to children, as teacher characteristics and classroom features appeared to not sufficiently explain what characterizes a high-quality environment, examining directly the quality of classroom interactions can provide unique and useful information for monitoring purposes and to regulate teaching interactions and practices. In addition, our findings extend previous research by suggesting the relevance of school-level factors, which is consistent with a systematic and contextualized vision of schools as complex, multilevel settings (Pianta 2006).

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