

## Teacher-Student Relationship and Self-Regulated Learning in Portuguese Compulsory Education<sup>1</sup>

Ângela Sá Azevedo<sup>2</sup>  
Paulo Cesar Dias  
Ana Salgado  
Teresa Guimarães  
Isabel Lima  
Andreia Barbosa

*Universidade Católica Portuguesa, Braga, Portugal*

**Abstract:** The aim of this paper was to explore the relationship between the students' perceptions of teachers' behavior and self-regulated learning in Mathematics. The study, conducted among a group of 625 students of Portuguese Compulsory Education (7th to 9th grades) using the QIPBásic and the IPAAr allowed us to understand differences in the aforementioned variables related with students' gender, age, grades and number of retentions, parents education, professor of Mathematics gender and number of years with the same teacher. The most relevant findings to teaching practice are relate to the positive relation between self-regulated learning and students' perception of their teachers with regard to leadership, helping/friendly, and understanding, as well as the negative relation between self-regulated learning and students' perception of uncertain, dissatisfied and admonishing of their teachers.

**Keywords:** teacher student interaction, self-regulation, elementary education, mathematics

### Relacionamento Professor-Aluno e Auto-Regulação da Aprendizagem no 3º Ciclo do Ensino Médio Português

**Resumo:** Este artigo teve como objetivo explorar a relação entre a percepção do comportamento do professor e auto-regulação da aprendizagem na Matemática. As respostas de 625 alunos do 3º ciclo do Ensino Médio Português (7º ao 9º anos) aos questionários QIPBásico e IPAAr permitiram perceber diferenças nas variáveis supracitadas em função do sexo, da idade, do ano de escolaridade e do número de retenções, do nível educacional dos pais, do sexo do professor de Matemática e do número de anos com o mesmo professor. As conclusões mais relevantes para a prática pedagógica prendem-se à relação positiva entre a auto-regulação da aprendizagem dos alunos e a percepção de liderança, apoio e compreensão por parte dos professores, e relação negativa entre a auto-regulação e a percepção de insatisfação, insegurança e repreensão dos seus professores.

**Palavras-chave:** interação professor-aluno, auto-regulação, ensino fundamental, matemática

### Relación Maestro-Alumno y el Aprendizaje Autorregulado en ESO Portugués

**Resumen:** Este artículo explora la relación entre la percepción de la conducta del maestro y el aprendizaje autorregulado en Matemáticas. Las respuestas del grupo de 625 estudiantes de ESO Portugués (7º a 9º grados) a los instrumentos QIPBásico y IPAAr nos permiten percibir diferencias en las variables antes mencionadas en materia de género, edad, años de escolaridad y número de cursos suspensos, estudios de los padres, género del maestro en Matemáticas y el número de años con el mismo maestro. Las implicaciones educativas más relevantes se refieren a la relación positiva entre el aprendizaje autorregulado y la percepción de los estudiantes en lo que respecta al liderazgo, apoyo y comprensión, así como la relación negativa entre la autorregulación del aprendizaje con la percepción de insatisfacción, inseguridad y repreensión de sus profesores.

**Palabras clave:** interaccion profesor-estudiante, autorregulación, enseñanza de primer grado, matematica

The present study, grounded in the constructivist perspective, explores the relationship between the perception of the behavior of the professor of Mathematics and the self-regulation of learning by the student. Based on contributions from research and practice, this study aims to learn more about the role of teachers, through their style of interaction,

in promoting the self-regulated learning of the students. Studies over the last 30 years have revealed that students learn best when they perceive a more positive classroom environment (Dorman, 2002; Fraser, 1998). As the adult responsible for the educational process, it is up to the teacher to establish a positive relationship with the students, promoting a sense of affiliation, cohesion, mutual respect, support and success in the learning (Brok, Levy, Brekelmans, & Wubbels, 2005; Fraser, 2002; Hoy & Weinstein, 2006; Patrick, Ryan, & Kaplan, 2007; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008; Wubbels, Levy, & Brekelmans, 1997). To teach in a classroom is a challenging task developed in a complex environment, where emotional, interpersonal and environmental factors, relative to the teacher, the student, the

<sup>1</sup> Paper derived from the Master's Dissertation of the sixth author, under the supervision of the first, defended in the context of the 2nd cycle in Educational Psychology of the Faculdade de Filosofia da Universidade Católica Portuguesa.

<sup>2</sup> Correspondence address:

Ângela Sá Azevedo. Faculdade de Filosofia, Praça da Faculdade, 1. CEP 4710-297. Braga, Portugal. E-mail: angelasaazevedo@gmail.com

group and all the elements of the classroom context, act simultaneously (Fisher, Waldrup, Dorman, & Brok, 2007).

This work takes an interpersonal approach to the management of the classroom (Wubbels, 2007), based on a model that has shown solid theoretical and empirical evidence in multiple cultural contexts (Wubbels & Brekelmans, 2005), the Model for Interpersonal Teacher Behaviour (Wubbels, Créton, & Hooymayers, 1985). In this model it is assumed that the teacher is ultimately responsible for the interaction dynamics that occur in this context, with it being the teacher's job to guide and regulate the relationships, to decide and manage the activities and to support the students, with the aim of making the learning productive and promoting an enjoyable process of positive interactions between all the elements.

The model, developed with its foundation in Timothy Leary's interpersonal diagnosis of personality (1957), is organized along two axes that represent the important dimensions in communication (Figure 1): the Influence (measured by how the teacher directs and controls the communication) and the Proximity (the degree of cooperation and closeness between the teacher and the student) (Wubbels, Brekelmans, Brok, & Tartwijk, 2006). Influence, located on the vertical axis, is organized into two dimensions: Dominance (D: the teacher determines the activities of the students), and Submission (S: the students determine their activities). Diverse behaviors of the teacher are encountered within this DS axis related to Leadership, Student Responsibility/Freedom, Uncertainty and Strictness. Proximity, which assumes the horizontal axis, is constructed by the dimensions Cooperation (C: the teacher demonstrates approval of the students) and Opposition (O: the teacher demonstrates disapproval of the students and of their behavior). The behaviors that correspond to this CO axis are Helpful/Friendly, Understanding, Dissatisfied and Admonishing (Oord & Brok, 2004).

According to previous studies, the teachers who contribute most to the success of the students exhibit behavior

patterns of Dominance (high level of Influence) and Cooperation (high level of Proximity) (Wubbels & Brekelmans, 2005; Wubbels et al., 2006). However, beyond the intentions of the teacher, it seems essential to address the thoughts, beliefs and feelings of the students concerning the characteristics of the teacher (Schunk & Meece, 2006). According to Khine and Fisher (2004) this perception of the behavior of the teacher is a strong mediator between the instructional characteristics and the academic results. When students feel help and emotional support from the teacher, they strive more in the school tasks, expend greater effort, ask for help and use self-regulatory strategies of learning, achieving better academic results (Patrick et al., 2007). Conversely, the perception of poor classroom management stimulates the resistance of the students towards the school work and, consequently, inappropriate behavior, which may even contribute to school violence (Wubbels, 2007).

The literature indicates that the models of self-regulated learning emphasize the role of motivational and contextual factors in the learning and cognition of the students (Gungoren, 2009). According to Schunk and Zimmerman (1994) self-regulated learning results from two key sources: the social influence and the influence of the direct experiences. When a teacher integrates self-regulatory strategies into the curriculum of their discipline to achieve a task (Boekaerts & Niemivirta, 2000), this functions, not only as a lever in the promotion of the intuitive experience of the students, but also puts into practice the explicit instruction of these strategies leading students to comprehend and internalize the use of them (Rosário et al., 2006), which appears in the literature to be systematically associated with better school results (Ommundsen, 2006; Pintrich, 2000; Rosário, 2004; Schunk, 2005).

According to Rosário (2004), self-regulated learning is understood as an active process in which the subjects set the goals that guide their learning, trying to monitor, regulate and control their cognition, motivation and behavior in order to achieve these goals. Based on the model of Zimmerman (1998, 2000), Rosario (2004) proposes a self-regulated model for learning, called PLEA, which describes a cyclical movement, structured in three phases: Planning, Implementation and Evaluation. This model is sequential, in which each phase operationalizes the same cyclic process in itself. In short, in the Planning, the students think about what they want to do and prepare a plan to know when and how they will accomplish it; in the next stage, they put into practice and monitor the previously defined plan; and in the Evaluation, they determine the extent to which the aims were met to solidify this plan. This is a concept that has been investigated in depth since the 1990s, especially in the works of Zimmerman (Zimmerman, 1994; Zimmerman & Martinez-Pons, 1990). The investigation has shown some relevant data, especially with regards to the personal variables, with PLEA appearing to be favored by the girls (Boekaerts & Corno, 2005; Fernandes, 2009; Raffaelli, Crockett, & Shen, 2005; Zimmerman & Martinez-Pons, 1990), of earlier ages

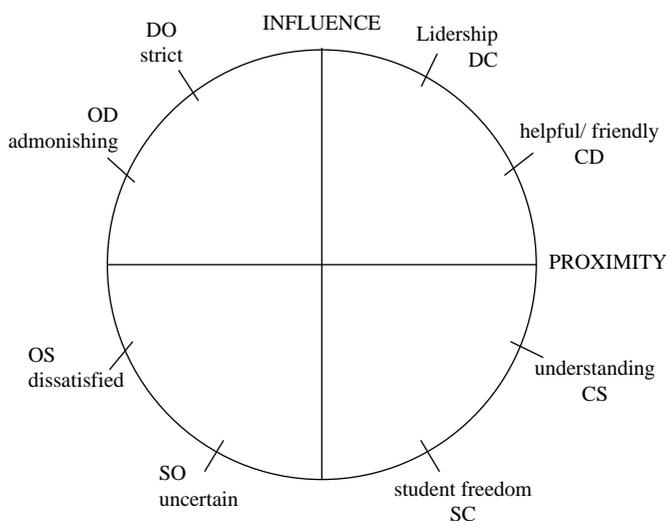


Figure 1. Model for Interpersonal Teacher Behavior (Wubbels et al., 2006).

(Raffaelli et al., 2005) and becoming more efficient with the increase in age (Rosário, Soares, Núñez Perez, González-Pienda, & Rubio et al., 2004; Zimmerman, 1994; Zimmerman & Martinez-Pons, 1990).

Considering, however, the paucity of studies that relate the two constructs, this article aims to explore how the perception of the students, regarding the behavior of the teachers in the classroom, is associated with self-regulated learning in Mathematics. Given the many studies that have shown that students demonstrate marked difficulties in learning mathematical content (Castro, 2007; Leandro, 2006; Ramalho, 2004; Soares, 2007) this discipline, with a high failure rate and simultaneously of great importance in the school curriculum, was selected for this investigation due to its relevance.

## Method

### Participants

The sample was comprised of 625 students from 25 classes of two associated public schools, of the districts of Porto and Braga, northern Portugal, with 53% male ( $N = 334$ ) and 47% female ( $N = 291$ ), aged between 12 and 18 years ( $M = 13.59$ ;  $SD = 1.12$ ). The students attending the 3rd cycle of Portuguese Compulsory Education were equitably distributed in the 7<sup>th</sup> ( $N = 209$ ; 33%), 8<sup>th</sup> ( $N = 205$ ; 33%) and 9<sup>th</sup> years ( $N = 211$ ; 34%).

### Instruments

The instruments used are described below.

*Biographical and School Data Form*: constructed for this project, it considered information regarding the gender, age, and school grade of the student, the number of years repeated throughout the educational course, the parental education level, the gender of the Mathematics teacher and the number of years spent with the same Mathematics teacher.

*Questionnaire on Teacher Interaction (QTI Basic)*: the Portuguese adaptation of the QTI - Basic (Azevedo et al., 2010) was used to evaluate the perceptions of the students regarding the interaction with the Mathematics teacher. This instrument, consisting of 32 response items in a Likert type scale of three points (from 1, *Never*, to 3, *Always*), grouped into eight subscales, allows the evaluation of eight behavioral traits of the teacher. The dimensions Dominance/Submission consist of: (a) Strict (e.g. “The teacher verifies, maintains and emphasizes strict rules”), (b) Leadership (e.g. “The teacher exercises leadership, captures and holds the students’ attention”), (c) Uncertain (e.g. “The teacher displays insecurities”), (d) Student Responsibility/Freedom (e.g. “The students are given opportunities to take responsibility for their activities”). The dimension Cooperation/Opposition includes: (a) Helpful/Friendly (e.g. “The teacher is friendly and provides support for the students”); (b) Understanding (e.g. “The teacher shows interest, concern and

understanding to the students); (c) Dissatisfied (e.g. “The teacher shows sadness/dissatisfaction with the students”); (d) Admonishing (e.g. “The teacher shows impatience/anger in the classroom”). In the preliminary results from the adaptation of the instrument a structure was found that replicates the two dimension design, in agreement with the original version, with generally acceptable internal consistency values, between 0.41 in the Strict subscale and 0.70 in the Leadership subscale (Azevedo et al., 2010). The QTI is an instrument that has been used in many cultures and, although the Brazilian version has weaker psychometric properties than in other cultures, it allows the role of the teacher-student relationship on cognitive and emotional variables to be studied (Wubbels et al., 2006).

*Self-regulation of Learning Processes Inventory - Revised (SRLPIr)*: this inventory was used to evaluate the self-regulatory processes of the students (Lourenço, 2007). It is an instrument consisting of nine items, in a five-point Likert response format (between 1 - *Never* and 5 - *Always*). Centered on a procedural dimension of the self-regulated learning, it evaluates each one of its stages - Planning (e.g. “I make a plan before starting to do a job. I think about what I will do and what is needed to complete it”), Implementation (e.g. “During lessons or when studying at home, I think about concrete aspects of my behavior to change and achieve my goals”); and Evaluation (e.g. “When I receive a mark, I think of concrete things that I have to do to improve”). The results suggest good psychometric characteristics (Lourenço, 2007). The alpha values of 0.74, 0.75 and 0.92 in the Planning, Implementation and Evaluation factors indicate good internal consistency.

### Procedure

**Data collection.** Data collection was performed at the beginning of the 3<sup>rd</sup> term of the 2009/2010 academic year, so there were no influences either due to the period of adaptation to new teachers, as in the 1<sup>st</sup> term, or due to the pressure of the final results of the 3<sup>rd</sup> term. After obtaining authorization from the pedagogical directors of the schools and the parents of the students, the instruments were applied collectively in the classroom context, by the class directors, as an extra curricular discipline. In the verbal instructions given to the students they were asked to focus their responses on the Mathematics discipline, with the same instructions written in the questionnaire. It should be noted that, as the schools have a contract of autonomy, they tend to present a stable framework of teachers that follow the students over a given education cycle. Thus, the Mathematics teacher can follow the students over the three years that make up the 3<sup>rd</sup> Cycle. In this study 25 classes participated, with 19 female Mathematics teachers and seven male. To maintain the ethical principles, when requesting the authorization of the parents and schools, the anonymous and confidential nature of the data was guaranteed, with the participation of the students being strictly voluntary.

**Data Analysis.** The collected data were coded and analyzed using the program Statistical Package for the Social Sciences (SPSS) version 16.0 for Windows. For the data analysis, statistical procedures appropriate for the characteristics of the variables were used (Maroco, 2007). After testing the normality of the data distribution, the Student's t-test for independent samples was applied in order to analyze the difference in means of two populations and the One-Way ANOVA to test the variance of the populational means of more than three groups. A significance level of 5% was used. To study the relationship between the metric variables Pearson's product-moment correlation was used.

### Ethical Considerations

The participants in this study were informed, in advance of the data collection, of the voluntary nature of the research, and that they could withdraw at any time. In addition, the anonymity and confidentiality of the data was guaranteed, so that no students or other people from the school would have access to the individual responses of any student. After clarification, the students signed the Terms of Free Prior Informed Consent.

## Results

### Teacher-Student Relationship, Self-regulation of Learning and Individual Variables of the Students

Through the data analysis, it was possible to find significant differences according to gender in the perception of the behavior of the teacher and in the self-regulated learning. The girls perceived the teacher as more Helpful/Friendly ( $t_{(601,473)} = 2.764; p = 0.006$ ) and Understanding ( $t_{(603,968)} = 2.717; p = 0.007$ ). The boys perceived the behavior of the teacher as providing greater Student freedom ( $t_{(610)} = -2.83; p = 0.005$ ), Dissatisfied ( $t_{(604)} = -4.32; p = 0.000$ ) and Admonishing ( $t_{(615)} = -4.198; p = 0.000$ ). In terms of the self-regulation of learning, the girls seemed to demonstrate more self-regulated behaviors in the total score of the scale ( $t_{(601)} = 3.148; p = 0.002$ ), in the Implementation phase ( $t_{(614)} = 3.513; p < 0.01$ ) and in the Evaluation phase ( $t_{(610,994)} = 3.525; p < 0.01$ ).

The results of the association between age and the perception of the relationship with the teacher demonstrated a negative correlation to the level of Leadership ( $r = -0.135; p < 0.01$ ) and positive, although weak, to the levels of Students freedom ( $r = 0.202; p < 0.01$ ), Uncertain ( $r = 0.145; p < 0.01$ ), Dissatisfied ( $r = 0.185; p < 0.01$ ), Admonishing ( $r = 0.152; p < 0.01$ ) and Strict ( $r = 0.086; p = 0.034$ ). There was also a weak negative correlation between age and self-regulation, in the Planning ( $r = -0.171; p < 0.01$ ), Implementation ( $r = -0.171; p < 0.01$ ), and Evaluation ( $r = -0.202; p < 0.01$ ) stages and in the total score of self-regulated learning scale ( $r = -0.211; p < 0.01$ ).

Data analysis according to the school year allowed significant differences to be perceived in the behavior of

the Mathematics teacher regarding the level of Leadership ( $F = 13.431; p < 0.01$ ), Understanding ( $F = 7.314; p = 0.005$ ), Student freedom ( $F = 17.568; p < 0.01$ ), Dissatisfied ( $F = 11.669; p < 0.01$ ) and Admonishing ( $F = 7.435; p = 0.001$ ) and in the phases of Implementation ( $F = 4.059; p = 0.018$ ), Evaluation ( $F = 6.304; p = 0.002$ ) and in the total of the self-regulated learning scale ( $F = 4.449; p = 0.012$ ). With the use of Scheffe's *Post Hoc* multiple comparison tests, it was possible to verify that the students of the 7<sup>th</sup> year presented a perception of greater Leadership ( $MD = 1.232; p < 0.01$ ), and Understanding ( $MD = 0.972; p = 0.001$ ) and lower Dissatisfied ( $MD = -1.208; p < 0.01$ ) and Admonishing ( $MD = -0.853; p = 0.004$ ) of the teacher than the students of the 8<sup>th</sup> year. The students of the 9<sup>th</sup> year still appeared to perceive greater Freedom ( $MD = -0.896; p < 0.01$ ), Dissatisfied ( $MD = -0.588; p = 0.004$ ) and Admonishing ( $MD = -0.484; p = 0.015$ ) than those of the 7<sup>th</sup> year; and greater Leadership ( $MD = 0.941; p < 0.01$ ), Understanding ( $MD = 0.754; p = 0.012$ ) and Freedom ( $MD = 0.936; p = 0.012$ ) in the behavior of the teacher than the students of the 8<sup>th</sup> year. With regard to the self-regulation of the learning, differences were found between the groups, with the students of the 7<sup>th</sup> year presenting higher scores than the students of the 9<sup>th</sup> year in the Implementation ( $MD = 0.702; p = 0.020$ ) and Evaluation ( $MD = 0.853; p = 0.004$ ) subscales and in the total score ( $MD = 1.957; p = 0.013$ ).

The results suggest significant differences between the groups in the scales Helpful/Friendly ( $F = 4.458; p = 0.012$ ), Understanding ( $F = 4.290; p = 0.014$ ), Student freedom ( $F = 3.923; p = 0.020$ ), Uncertain ( $F = 5.500; p = 0.004$ ), Dissatisfied ( $F = 3.460; p = 0.032$ ), and Admonishing ( $F = 3.419; p = 0.033$ ). Using Scheffe's *Post Hoc* multiple comparison tests it was verified that the students who had not repeated any year presented higher scores with statistically significant differences in the Helpful/Friendly ( $MD = 0.508; p = 0.015$ ) and Understanding ( $MD = 0.503, p = 0.026$ ) scales, compared to those who had repeated a year. Conversely, the students who had already repeated two or more years perceived greater Freedom ( $MD = -0.763; p = 0.025$ ), Uncertain ( $MD = -0.718; p = 0.019$ ) and Admonishing ( $MD = -0.705; p = 0.041$ ) compared with those who had not repeated any year. Also regarding the level of self-regulation in the learning, differences were found in the Planning ( $F = 14.278; p < 0.01$ ), Implementation ( $F = 7.094; p = 0.001$ ), Evaluation ( $F = 11.016; p < 0.01$ ) subscales and in the total score of the scale ( $F = 14.485; p < 0.01$ ). In the self-regulation of learning scale, significantly higher scores were found in the Planning ( $MD = 1.178; p < 0.01$ ), Implementation ( $MD = 0.964; p = 0.002$ ) and Evaluation ( $MD = 1.093, p = 0.001$ ) subscales, as well as in the total score of the scale ( $MD = 3.428; p < 0.01$ ) among those who had never repeated any year compared to those who had repeated one year. There were also higher scores in the Planning ( $MD = 1.218; p = 0.009$ ), and Evaluation ( $MD = 1.281; p = 0.013$ ) subscales and in the total score of the scale ( $MD = 3.250; p = 0.014$ ) for those who had never

repeated any year, in relation to those who had repeated two school years.

The results of the bivariate analysis demonstrated a negative relationship between the educational level of the father and the perception of the teacher being Uncertain ( $r = -0.087$ ;  $p = 0.040$ ). There was a statistically significant positive relationship between the educational level of the father and the Planning ( $r = 0.164$ ;  $p < 0.01$ ), and Evaluation ( $r = 0.112$ ;  $p < 0.01$ ) subscales and the total score of the self-regulation of learning scale ( $r = 0.117$ ;  $p < 0.01$ ). There was also a statistically significant positive relationship between the educational level of the mother and the Planning ( $r = 0.199$ ,  $p = 0.000$ ), and Evaluation ( $r = 0.156$ ,  $p = 0.000$ ) subscales and the total score of the self-regulation of learning scale ( $r = 0.159$ ;  $p = 0.000$ ).

### Teacher-Student Relationships, Self-regulation of Learning and Variables of the Mathematics Teacher

Despite the difference in relative frequency of teachers by gender (nineteen of the classes had a female teacher while only six classes had a male teacher), it was verified that, in the behavior of the female teachers, the students perceived greater Leadership ( $t_{(605)} = 1.963$ ;  $p = 0.050$ ), and Freedom ( $t_{(609)} = 4.564$ ;  $p = 0.000$ ), however, they were also perceived to be more Dissatisfied ( $t_{(603)} = 3.665$ ;  $p = 0.000$ ), Admonishing ( $t_{(614)} = 4.061$ ;  $p = 0.000$ ) and Strict ( $t_{(608)} = 2.104$ ;  $p = 0.036$ ).

From the data analysis, it was revealed that 97.1% of the 7<sup>th</sup> year students had the teacher for the first time, 88.2% of the 8<sup>th</sup> year students had the same teacher for the second year and 58% of the 9<sup>th</sup> year students had the same Mathematics teacher for the third year or more.

With the use of univariate analysis of variance to test the effect of this variable on the perception that the students had of the teacher's behavior, a greater perception of Leadership ( $F = 9.913$ ;  $p = 0.000$ ), Helpful/Friendly ( $F = 4.604$ ;  $p = 0.01$ ), Understanding ( $F = 3.858$ ;  $p = 0.022$ ) and Student freedom ( $F = 11.126$ ;  $p < 0.01$ ) was verified as the number of years with the same teacher increased. Using Scheffe's *Post Hoc* tests, it was found that the students who had the same teacher for three years or longer perceived behaviors marked by greater Leadership - when compared with those who had the same teacher for between one and two years ( $MD = 0.485$ ;  $p = 0.002$ ) and between two and three years ( $MD = 0.693$ ;  $p < 0.01$ ) and greater Freedom when compared with those who had the same teacher for between one and two years ( $MD = 0.699$ ;  $p < 0.01$ ) and between two and three years ( $MD = 0.693$ ;  $p < 0.01$ ). Furthermore, the students with the same Mathematics teacher for three years or more perceived the teacher as significantly more Helpful/Friendly ( $MD = -0.508$ ;  $p = 0.012$ ) and Understanding ( $MD = -0.495$ ;  $p = 0.025$ ) when compared with those who had had the same teacher for two years. No differences were verified in terms of the self-regulation of the learning.

As presented in Table 1, it was possible, in short, to verify a medium strength positive relationship between the self-regulation of the learning and the perception of behaviors of Leadership ( $r = 0.337$ ;  $p < 0.01$ ), Understanding ( $r = 0.325$ ;  $p < 0.01$ ) and Helpful/Friendly of the teacher ( $r = 0.301$ ;  $p < 0.01$ ) and a weak negative relationship between the self-regulation and the behaviors of Uncertain ( $r = -0.232$ ;  $p < 0.01$ ), Dissatisfied ( $r = -0.204$ ;  $p < 0.01$ ) and Admonishing ( $r = -0.138$ ;  $p < 0.01$ ) on behalf of the teacher.

Table 1

#### Perception of the Behavior of the Teacher and Self-regulation of the Learning

	Planning		Implementation		Evaluation		Self-regulation	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Leadership	0,290**	0,000	0,313**	0,000	0,285**	0,000	0,337**	0,000
Helpful/Friendly	0,262**	0,000	0,280**	0,000	0,263**	0,000	0,301**	0,000
Understanding	0,277**	0,000	0,306**	0,000	0,279**	0,000	0,325**	0,000
Student freedom	-0,001	0,975	-0,019	0,636	-0,100*	0,014	-0,055	0,184
Uncertain	-0,173**	0,000	-0,220**	0,000	-0,227**	0,000	-0,232**	0,000
Dissatisfaction	-0,147**	0,000	-0,199**	0,000	-0,206**	0,000	-0,204**	0,000
Admonishing	-0,120**	0,003	-0,126**	0,002	-0,142**	0,000	-0,138**	0,001
Strict	0,008	0,846	0,024	0,554	0,033	0,423	0,024	0,557

Note. *r* = Pearson correlation coefficient; *p* = significance; \* $p < 0.05$ , \*\* $p < 0.01$ .

## Discussion

The aim of the present work was to explore the relationship between the perception of students regarding the behaviors of teachers and the self-regulation of learning in Mathematics from the interpersonal perspective of the classroom (Wubbels, 2007). Although many studies can be

found on the role of the teacher-student interaction (Patrick et al., 2007; Pianta et al., 2008; Wubbels et al., 2006) and the relationship between the interaction of the teacher and cognitive and emotional variables of the students (Brekemans, 1989; Brok, 2001) a review of the literature did not find any studies concerning the relationship with self-regulation. Thus, the results presented allow some differences

to be perceived according to the demographic variables. The female students perceived a greater Proximity, manifested in the higher scores in the subscales of Understanding and Helpful/Friendly, while the boys perceived greater Freedom, Dissatisfied and Admonishing, scales that denote less Proximity and Influence of the teachers. Previous studies indicate differences according to gender in other dimensions, such as in the perception of Leadership (Khine & Fisher, 2004; Levy, Brok, Wubbels, & Brekelmans, 2003; Wubbels et al., 2006). Although these results may be associated with characteristics of the sample, they may be indicative of cultural and/or gender differences in the management of the classroom by Mathematics teachers or differences between students in interpreting the behavior of the teachers, since girls tend to be more aware of and to appreciate more behavior related to empathy, the support provided, the relationship of trust established, and the ability to listen and be patient, compared to boys.

Regarding the self-regulated learning, the results encountered are in agreement with the literature, verifying the highest mean scores among the girls in all the subscales (with the Planning subscale presenting no statistically significant differences) (Boekaerts & Corno, 2005; Fernandes, 2009; Monteiro, 2009; Raffaelli et al., 2005; Zimmerman & Martinez-Pons, 1990). Furthermore, with regard to the relationship between age and the perception of the behavior of the teacher, partially discordant results were found in relation to those referred to in the literature (Levy et al., 2003). The data of the present study suggest an inverse association with Leadership and a direct association with Freedom, Dissatisfaction, Uncertainty, Admonishment and Strictness of the teacher. These data suggest that probably the older students indicate more behaviors that reveal less Proximity and Influence on behalf of their teachers, with signs of disfavor, of disapproval of the behavior of the students, and of demand while simultaneously allowing the students to determine their own activities in the classroom. It can be perceived, therefore, that in the view of these students, the Mathematics teachers at the end of the 3<sup>rd</sup> cycle of Portuguese Compulsory Education exert less Leadership, allowing the students to take a more active role in their learning and to perform work more independently with more responsibility and freedom. Conversely the same students evaluate the behavior of their teachers as repressive and insecure with signs of dissatisfaction, perhaps because they feel that they continue to assume a posture typical of the traditional model of education. Or perhaps, similar to the study by Cabral, Carvalho and Ramos (2004), the students entered into this new paradigm will not comply with their role, not acting as they should, because there is a lack of respect, interest and commitment. These results highlight the need for careful reflection on the most appropriate educational practices to implement with older students. Similarly, when the perception of the behavior of the teacher is analyzed as a function of the schooling of the participants,

higher Dominance was observed among the younger students and less Proximity and Influence perceived by the students of the 9<sup>th</sup> year of schooling, which contradicts the literature that suggests that older students evaluate teachers as more friendly and less uncertain (Levy et al., 2003).

The results relative to the self-regulation of the learning show lower scores among the subjects in later years in all the subscales except for in the Planning phase (which, although lower, did not present statistically significant differences). However, in concordance with the Portuguese studies, these data contradict the international literature that indicates that the self-regulated behaviors become more robust, focused, effective and strategic as the subject develops (Castro, 2007; Cunha, 2002; Rosario et al., 2004; Zimmerman, 1994; Zimmerman & Martinez-Pons, 1990). These results may be related to various aspects including the facts that, according to the developmental perspective, the evaluation of these subjects is guided by more stringent criteria than in their younger peers, their motivation for academic affairs may be affected by other interests, and there is an increase in the level of difficulty of the syllabus, all of which lead to negative school results in the Mathematics discipline.

The results suggest a lower perception of the teacher in the Helpful/Friendly and Understanding subscales and higher in those of Freedom, Uncertain, and Admonishing among the students who present one, two or more school years repeated. These behaviors of the teacher, according to other studies, relate negatively with academic performance (Khine & Fisher, 2004; Wubbels & Brekelmans, 2005; Wubbels et al., 2006) increasing the resistance of these students to the academic activities and increasing the risk of disruptive behavior (Wubbels, 2007). This route can be countered by teachers who show leadership skills, who help and understand the students, and provide them with some freedom and responsibility (Dorman, 2002; Fraser, 1998; Oord & Brok, 2004; Wubbels & Levy, 1993). This component of the Interpersonal Model of Teacher Behavior highlights the need for the subject to perform a role as an agent, integrated into a school context that gives opportunities of choice and control, in favor of the development of the self-regulatory skills, which in this group of individuals with repeated school years are possibly depressed due to the experience of marked failure, adversely affecting not only the perception of the teacher-student relationship but also their sense of self-efficacy.

The data seem to suggest an important role regarding the parental educational level in promoting self-regulation, such as in the decrease of the perception of uncertainty in the behavior of the teachers. In fact, the literature suggests that the parents often take a leading role in promoting self-regulation, serving as models and sources of support and instruction (Grolnick & Ryan, 1989; Rosário, 2002; Schunk, 2001). Thus, fathers/mothers with higher academic qualifications may express a greater involvement in

the school life of the children, promoting higher future expectations compared to fathers/mothers with low educational levels, in that the former feel better prepared for such involvement (Epstein, 2001). Additionally, they will have a more appropriate response capacity when asked by their children to provide them with support in performing certain school tasks (Castro, 2007). A perception of greater Leadership, Helpful/Friendliness, Understanding and Student freedom was encountered according to the number of academic years with the same Mathematics teacher. This might suggest, according to some studies, that pedagogic continuity favors a relationship of Proximity with students with positive consequences for the academic performance, (Brok, 2001; Brok, Brekelmans, & Wubbels, 2004; Patrick et al., 2007; Wubbels & Brekelmans, 2005).

Finally, the results suggest consistent relationships between the perception of the behavior of the teacher and self-regulation of the learning, in line with studies that describe a positive relationship between the profile of the teacher and academic and emotional dimensions of the students (Brekelmans, 1989; Brekelmans, Wubbels, & Levy, 1993; Henderson, Fisher, & Fraser, 1994; Brok, 2001). Data from this study revealed a positive relationship between the self-regulation of learning and the perception of Leadership, Helpful/Friendliness and Understanding, as well as a negative relationship between self-regulation of learning and the perception of Uncertainty, Dissatisfaction and Admonishment, which indicates the positive influence of the behavior of the Mathematics teacher guided by greater Proximity and Influence on the self-regulation of learning of the students. This also works in reverse since a student with more self-regulatory skills will have a greater probability of perceiving the teacher as someone who guides and understands their needs, without frequent expressions of uncertainty, disfavor and impatience. Other studies emphasize the positive effect of the Influence dimension when describing teachers with directive, authoritarian but also tolerant profiles, who are able to provide conditions for better performance of the students, as well as more appropriate attitudes faced with the learning (Wubbels et al., 2006).

### Conclusions

In the present study the aim was to explore the teacher-student relationship and the level of self-regulation of learning in Mathematics. The results seem to reinforce the role of educators (parents and teachers), not only in promoting cognitive and emotional variables but also in competences that allow students to manage these skills, thus acting in their own learning and motivation to achieve their objectives.

This study confirms the educational level of the parents as a protective factor, reinforces the importance of pedagogical continuity, highlights the effects of repeating school years and especially raises reflection on the decrease in the self-regulation of learning, Influence and Proximity as

students advance in the 3<sup>rd</sup> cycle of Portuguese Compulsory Education / Cycle II of the Elementary Education, risk factors associated with the decrease in productivity.

The impact of the behavior of the teacher also highlights the importance of introducing good practices that promote self-regulatory skills in students. This concern can be achieved through curricular infusion of learning strategies in the different disciplines that make up the academic curriculum as well as through programs specifically implemented in the schools for this purpose.

Although the data present a set of interesting indications, it is important to reflect on some limitations that should be considered. To carry out this study a convenience sample of associated Portuguese public schools was used, which means that the teachers are chosen by the institution and have greater stability, which is not necessarily generalizable for other schools. Furthermore, it was not possible to collect information relative to the classifications of the students, which would add data relevant for a better understanding of the effect of these variables. Therefore, it is suggested that more comprehensive studies be performed, with more diverse samples, including variables that allow a better comprehension of this relationship, such as self-concept, self-efficacy, and motivation of the student, important mediators of academic performance.

Given the results, it is important to know better the factors that influence the perception of the teacher-student interaction and to perform multi-level studies that allow a better understanding of the factors that most influence the interpretation of the students regarding the behavior of the teacher. By better understanding the determinants of this perception, more reliable data will be available to intervene in the promotion of the pedagogical relationship, working with the teachers and also with the variables that may be relevant to the behavior of the students, the class, the school or the families.

### References

- Azevedo, A. S., Dias, P. C. A., Guimarães, T., Lima, I., Salgado, A., Fonte, D., Wubbels, T., & Brok, P. (2010, April). *Exploring teacher-students interaction and school achievement of younger students: Contributions of the Questionnaire on Teacher Interaction adaptation to Portuguese context*. Work presented at the International Conference on Interpersonal Relationships in Education, Boulder, CO.
- Boekaerts, M., & Corno, L. (2005). Self-regulation in the classroom: A perspective on assessment and intervention. *Applied Psychology: An International Review*, 54(2), 199-231. doi: 10.1111/j.1464-0597.2005.00205.x
- Boekaerts, M., & Niemivirta, M. (2000). Self-regulated learning: Finding a balance between learning goals and ego-protective goals. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 417-450). San Diego, CA: Academic Press.

- Brekelmans, M. (1989). *Interpersonal teacher behavior in the classroom*. Utrecht, Holland: W. C. C.
- Brekelmans, M., Wubbels, T., & Levy, J. (1993). Student performance, attitudes, instructional strategies and teacher-communication style. In T. Wubbels & J. Levy (Eds.), *Do you know what you look like?: Interpersonal relationships in education* (pp. 56-63). London: The Falmer.
- Brok, P. (2001). *Teaching and student outcomes: A study on teachers' thoughts and actions from an interpersonal and a learning activities perspective*. Utrecht, Holland: W. C. C.
- Brok, P., Brekelmans, M., & Wubbels, T. (2004). Interpersonal teacher behaviour and student outcomes. *School Effectiveness and School Improvement*, 15(3-4), 407-442. doi: 10.1080/09243450512331383262
- Brok, P., Levy, J., Brekelmans, M., & Wubbels, T. (2005). The effect of teacher interpersonal behaviour on students' subject-specific motivation. *Journal of Classroom Interaction*, 40(2), 20-33.
- Cabral, F. M. S., Carvalho, M. A. V., & Ramos, R. M. (2004). Dificuldades no relacionamento professor/aluno: Um desafio a superar. *Paidéia (Ribeirão Preto)*, 14(29), 327-335. doi: 10.1590/S0103-863X2004000300008
- Castro, M. A. S. N. (2007). *Processos de auto-regulação da aprendizagem: Impacto de variáveis acadêmicas e sociais* (Unpublished Master's Dissertation). Universidade do Minho, Braga, Portugal.
- Cunha, A. M. E. M. (2002). *Aprendizagem auto-(des) regulada? Rotas e percursos em alunos dos 2º e 3º ciclos do ensino básico* (Unpublished Master's Dissertation). Universidade do Minho, Braga, Portugal.
- Dorman, J. (2002). Classroom environment research: Progress and possibilities. *Queensland Journal of Educational Research*, 18(2), 112-140.
- Epstein, J. L. (2001). *School, family, and community partnerships: Preparing educators and improving schools* (2nd ed.). Boulder, CO: Westview.
- Fernandes, L. M. D. (2009). *Auto-regulação e abordagens à aprendizagem: Um estudo do (in)sucesso a matemática no 6º e 9º anos de escolaridade* (Unpublished Master's Dissertation). Universidade do Minho, Braga, Portugal.
- Fisher, D. L., Waldrip, B. G., Dorman, J., & Brok, P. (2007, Abril). *Typology of interpersonal education for primary education*. Trabalho apresentado no Annual Meeting of the American Educational Research Association, Chicago, IL.
- Fraser, B. (1998). Science learning environments: Assessment, effects and determinants. In B. Fraser & K. G. Tobin (Eds.), *International handbook of science education* (pp. 527-564). Dordrecht, Netherland: Kluwer Academic.
- Fraser, B. J. (2002). Learning environments research: Yesterday, today and tomorrow. In S. C. Goh & M. S. Khine (Eds.), *Studies in educational learning environments: An international perspective* (pp. 1-26). Singapore: World Scientific.
- Gungoren, S. (2009). *The effect of grade level on elementary school students' motivational beliefs in science* (Unpublished Master's Dissertation). Middle East Technical University, Ankara, Turquia.
- Grolnick, W. S., & Ryan, R. M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology*, 81(2), 143-154. doi:10.1037/0022-0663.81.2.143
- Henderson, D., Fisher, D., & Fraser, B. (1994, August). *Learning environments and student outcomes in senior high school biology classes*. Work presented at the Annual Meeting of National Association for Research in Science Teaching, Anaheim, CA.
- Hoy, A. W., & Weinstein, C. S. (2006). Student and teacher perspectives on classroom management. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 181-219). Mahwah, NJ: Lawrence Erlbaum.
- Khine, M. S., & Fisher, D. L. (2004). Teacher interaction in psychosocial learning environments: Cultural differences and their implications in science instruction. *Research in Science & Technological Education*, 22(1), 99-111. doi: 10.1080/0263514042000187566
- Leandro, R. N. (2006). *Insucesso escolar na matemática: Um (outro) olhar: Percepção dos alunos do 6º ano do ensino básico sobre o insucesso escolar na matemática* (Unpublished Master's Dissertation). Universidade do Minho, Braga, Portugal.
- Levy, J., Brok, P., Wubbels, T., & Brekelmans, M. (2003). Students' perceptions of interpersonal aspects of the learning environment. *Learning Environments Research*, 6(1), 5-36. doi: 10.1023/A:1022967927037
- Loureço, A. A. (2007). *Processos auto-regulatórios em alunos do 3º ciclo do ensino básico: Contributos da auto-eficácia e da instrumentalidade* (Unpublished Ph.D Thesis). Universidade do Minho, Braga, Portugal.
- Maroco, J. (2007). *Análise estatística com utilização do SPSS* (3rd ed.). Lisboa: Sílabo.
- Monteiro, A. P. (2009). *Estudo do (In) sucesso a Matemática no 6.º e 9.º ano de escolaridade: Auto-regulação e procrastinação*. (Unpublished Master's Dissertation). Universidade do Minho, Braga, Portugal.
- Ommundsen, Y. (2006). Pupils' self-regulation in physical education: The role of motivational climates and differential achievement goals. *European Physical Education Review*, 12(3), 289-315. doi: 10.1177/1356336X06069275
- Oord, L., & Brok, P. (2004). The international teacher: Students' and teachers' perceptions of preferred teacher-student interpersonal behaviour in two United World Colleges. *Journal of Research in International Education*, 3(2), 131-155. doi: 10.1177/1475240904044384

- Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of Educational Psychology, 99*(1), 83-98. doi: 10.1037/0022-0663.99.1.83
- Pianta, R. C., Belsky, J., Vandergrift, N., Houts, R., & Morrison, F. J. (2008). Classroom effects on children's achievement trajectories in elementary school. *American Education Research Journal, 45*(2), 365-397. doi: 10.3102/0002831207308230
- Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92*(3), 544-555. doi: 10.1037/0022-0663.92.3.544
- Raffaelli, M., Crockett, L. J., & Shen, Y.-L. (2005). Developmental stability and change in self-regulation from childhood to adolescence. *Journal of Genetic Psychology: Research and Theory on Human Development, 166*(1), 54-75. doi: 10.3200/GNTP.166.1.54-76
- Ramalho, G. (2004). *Resultados do estudo internacional PISA 2003*. Lisboa: Ministério da Educação/Gave.
- Rosário, P. (2002). *Estórias sobre o estudar, histórias para estudar: Narrativas auto-regulatórias na sala de aula*. Porto, Portugal: Porto Editora.
- Rosário, P. (2004). *Estudar o estudar: As (des)venturas do Testas*. Porto, Portugal: Porto Editora.
- Rosário, P., Mourão, R., Salgado, A. I. G., Rodrigues, A., Silva, C. S. T., Marques, C., Amorim, L., Machado, S., Núñez Pérez, J. C., González-Pianda, J. A., & Hernández-Pina, F. (2006). Trabalhar e estudar sob a lente dos processos e estratégias de auto-regulação da aprendizagem. *Psicologia, Educação e Cultura, 10*(1), 77-88.
- Rosário, P., Soares, S., Núñez Perez, J. C., González-Pianda, J. A., & Rubio, M. (2004). Processos de auto-regulação da aprendizagem e realização escolar no ensino básico. *Psicologia, Educação e Cultura, 8*(1), 141-157.
- Schunk, D. H. (2001). Social cognitive theory and self-regulated learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (2<sup>nd</sup> ed., pp. 125-151). Mahwah, NJ: Lawrence Erlbaum.
- Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist, 40*(2), 85-94.
- Schunk, D. H., & Meece, J. L. (2006). Self-efficacy in adolescence. In F. Pajares & T. Urdan (Eds.), *Adolescence and Education* (vol. 5, pp. 71-96). Greenwich, CT: Informatikon Age Publishing.
- Schunk, D. H., & Zimmerman, G. J. (Eds.). (1994). *Self-regulation of learning and performance: Issues and educational applications*. Hillsdale, NJ: Lawrence Erlbaum.
- Soares, S. F. S. M. (2007). *Auto-regulação da tomada de apontamentos no ensino básico* (Unpublished Ph.D Thesis). Universidade do Minho, Braga, Portugal.
- Wubbels, T. (2007). Classroom management around the world. In M. Hayden, J. Levy, & J. J. Thompson (Eds.), *The Sage handbook of research in international education* (pp. 267-280). London, England: Sage.
- Wubbels, T., & Brekelmans, M. (2005). Two decades of research on teacher-student relationships in class, chapter 1. *International Journal of Educational Research, 43*(1-2), 6-24. doi:10.1016/j.ijer.2006.03.003
- Wubbels, T., & Levy, J. (1993). *Do you know what you look like?: Interpersonal relationships in education*. London: The Falmer.
- Wubbels, T., Créton, H. A., & Hooymayers, H. P. (1985). Discipline problems of beginning teachers, interactional behavior mapped out [Abstract]. *Resources in Education, 20*(12), 153. (Work presented at the Annual Meeting of American Educational Research Association, Chicago, IL).
- Wubbels, T., Levy, J., & Brekelmans, M. (1997). Paying attention to relationships. *Educational Leadership, 54*(7), 82-86.
- Wubbels, T., Brekelmans, M., Brok, P., & Tartwijk, J. (2006). An interpersonal perspective on classroom management in secondary classrooms in the Netherlands. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 1161-1191). Mahwah, NJ: Lawrence Erlbaum.
- Zimmerman, B. J. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 2-21). Hillsdale, NJ: Lawrence Erlbaum.
- Zimmerman, B. J. (1998). Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 1-19). New York: Guilford.
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.
- Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology, 82*(1), 51-59. doi: 10.1037/0022-0663.82.1.51

Received: May 10<sup>th</sup> 2011

1<sup>st</sup> Revision: Jul. 08<sup>th</sup> 2011

2<sup>nd</sup> Revision: Aug. 09<sup>th</sup> 2011

Approved: Oct. 04<sup>th</sup> 2011

*Ângela Sá Azevedo* is an Assistant Professor of the Faculdade de Filosofia of the Universidade Católica Portuguesa de Braga, Portugal.

*Paulo César Dias* is an Assistant Professor of the Faculdade de Filosofia of the Universidade Católica Portuguesa de Braga, Portugal.

*Ana Salgado* is a Trainee Assistant of the Faculdade de Filosofia of the Universidade Católica Portuguesa de Braga, Portugal.

*Teresa Guimarães* holds an MSc in Psychology of Child Development and Education from the Post-graduate Program of the Faculdade de Psicologia e Ciências da Educação of the Universidade do Porto, Portugal.

*Isabel Lima* holds an MSc in School Psychology from the Post-graduate Program of the Universidade do Minho, Braga, Portugal.

*Andreia Barbosa* holds an MSc in Educational Psychology from the Post-graduate Program of the Faculdade de Filosofia of the Universidade Católica Portuguesa de Braga, Portugal.

*How to cite this article:*

Azevedo, A. S., Dias, P. C., Salgado, A., Guimarães, T., Lima, I., & Barbosa, A. (2012). Teacher-student relationship and self-regulated learning in portuguese compulsory education. *Paidéia (Ribeirão Preto)*, 22(52), 197-206. doi:10.1590/S0103-863X2012000200006