



Relationships Between Perceived Feedback
Usefulness and Students' Homework
Variables at Elementary School Level

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Dissertação de Mestrado
Mestrado Integrado em Psicologia

Trabalho realizado sob a orientação do
Professor Doutor Pedro Rosário
e da
Doutora Jennifer Cunha

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Sofia Isabel Pereira Almeida

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A vida é uma oportunidade para conhecer e viver muitas coisas agradáveis e de uma beleza sem igual, tal como o término deste percurso.

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Eu, por mais que eu tente entender	Para veres onde eu estou
A falta que fazes aqui	Onde eu consegui chegar
Nunca vou conseguir	É verdade, morro de saudade
E nas promessas que eu faço para te lembrar	De te ter aqui
É quando eu consigo sonhar	É verdade, morro de saudade
Com tudo o que foste para mim	Mas eu sei que estás aí a olhar por mim
E é nos meus dias maus, quando já não sei	Vais, comigo p'ra todo o lado
quem sou	E é no meu peito que eu te tenho levado
Tento gritar ao céu para que me possas ouvir	Eu, eu segui os teus conselhos
E é nos meus dias bons, que gostava de te	Lutei por aquilo que quis
falar	E muito devo-te a ti (...)

Melodia Da Saudade

Fernando Daniel

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

Sofia Isabel Pereira Almeida

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Relações Entre a Utilidade Percebida do Feedback e Variáveis dos Trabalhos Para Casa dos Alunos no Ensino Básico

Resumo

Os benefícios dos Trabalhos Para Casa (TPC) no envolvimento escolar e desempenho dos alunos depende de vários fatores, como por exemplo, o feedback fornecido pelos professores. No entanto, é importante que esse feedback seja percebido pelos alunos como útil para que tenha impacto no seu envolvimento no TPC. A utilidade percebida do feedback de TPC tem recebido pouca atenção na literatura, nomeadamente no ensino primário. Assim, este estudo analisou as relações entre a utilidade percebida do feedback de TPC de alunos do ensino básico em três variáveis dos TPC: esforço, emoções e o uso de estratégias de autorregulação nas tarefas de TPC. Os participantes incluíram alunos de matemática do 5.º ($n = 125$) e 6.º ($n = 174$) anos que responderam a instrumentos de autorrelato. O modelo de regressão multivariado mostrou que, controlando o género e o rendimento prévio, a utilidade percebida do feedback dos TPC foi positivamente relacionada às três variáveis resultado. Estes resultados indicam que se os alunos perceberem o feedback dos TPC como útil, é provável que eles aumentem o seu esforço nos TPC, as emoções positivas para com os TPC e o uso de estratégias de autorregulação. Por isso, para melhorar o envolvimento dos alunos nos TPC, parece relevante que professores sejam sensíveis à forma como o feedback dos TPC é percebido pelos alunos.

Palavras-chave: Emoções nos trabalhos para casa; Esforço nos trabalhos para casa; Estratégias de autorregulação; Matemática; Utilidade do feedback dos trabalhos para casa

**Relationships Between Perceived Feedback Usefulness and Students' Homework Variables at
Elementary School Level**

Abstract

The benefits of homework to students' school engagement and achievement depends on several factors; for example, feedback provided by the teacher. However, it seems important to homework engagement that this feedback be perceived by students as useful, a variable that has received little attention in the literature, namely at elementary school level. Thus, this study analyzed the relationships between elementary school students' perceived homework feedback usefulness on three dimensions of homework engagement variables: effort, emotions, and the use of self-regulation strategies in homework assignments. The participants included 5th ($n = 125$) and 6th ($n = 174$) graders of mathematics who responded to self-report instruments. A multivariate regression model showed that, controlling for gender and prior achievement, perceived homework feedback usefulness was positively, but differently, related to the three outcome variables. These results indicate that when students perceive homework feedback as useful, they are likely to increase their homework effort, positive homework emotions and the use of self-regulation strategies. Therefore, to enhance student's homework engagement, it becomes relevant that teachers are sensitive to the way homework feedback is perceived by students.

Keywords: Homework effort; Homework emotions; Homework feedback usefulness; Mathematics; Self-regulation strategies

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Introduction

Homework is a common task assigned by teachers to their students throughout schooling (Bembenuddy, 2011; Cooper, 2001; Rosário et al., 2019). Although several arguments persist, either in favor or against this practice, the assignment of these tasks is carried out regularly, almost daily, in most classrooms (Danielson et al., 2011). Homework seems to play an important role in the child's daily routine (Cooper et al., 2006; Fan et al., 2017), since it promotes autonomy, responsibility, creates work habits and helps with monitoring and reinforcing learning (Cunha et al., 2018). However, the benefits of this educational tool to students' school engagement and achievement depends on homework characteristics (e.g., amount, frequency, purposes), such as students' perception of homework quality (Dettmers et al., 2010; Rosário et al., 2018); and teacher feedback, namely written comments and graded homework (Fan et al., 2017; Walberg et al., 1985). However, these types of homework feedback are used by a small number of teachers (e.g., Cunha et al., 2018). Research focusing these and other types of homework feedback commonly used by teachers as perceived by students (e.g., checking homework completion or homework control, checking homework on the board) showed low effect sizes on students' school and homework engagement (Cunha et al., 2019; Trautwein et al., 2006). Xu (2016) stated that students' perception of feedback quality (i.e. how students perceive feedback as helpful and useful) could, instead, be "more powerful" to their homework engagement than the perception of feedback amount or frequency (p. 103). However, this variable has been receiving little attention by researchers, especially at elementary school level. Hence, the current study aims to fulfill this research gap by analyzing the relationships between elementary school students' perceived homework feedback usefulness on their homework engagement variables. The Multilevel Homework Model (Dettmers et al., 2011; Trautwein et al., 2006) provides a relevant theoretical framework for the current study.

Theoretical Framework

The Multilevel Homework Model (MHM) by Trautwein et al. (2006) was based on empirical evidence about homework and on theoretical models (e.g., motivational, of learning). The MHM includes three major groups of predictors: i) learning environment/teacher/homework characteristics (e.g., perception of homework quality, homework adaptivity, teacher control); ii) student characteristics (e.g., gender, prior achievement); and iii) parents' role (e.g., homework help, parental homework attitudes). Each one of these variables predicts students' homework motivation variables (expectancy and value beliefs), which in turn, predicts homework behaviors (homework effort, homework time and cognitive and metacognitive learning strategies used by students), and the former predicts academic achievement.

Subsequently, Dettmers et al. (2011) added students' homework emotions to the mentioned model. In sum, the MHM comprises three dimensions of students' homework engagement: behavioral, cognitive and emotional (see Flunger et al, 2015).

Homework Research Findings

Trautwein and colleagues have been testing the relationships between the variables of the MHM model throughout the years (e.g., Trautwein, 2007; Trautwein & Ludtke, 2007, 2009; Trautwein et al., 2009). Other authors have also been investigating predictors of students' homework engagement, as homework purposes (e.g., Rosário et al., 2018), personality traits (e.g., Meyer et al., 2019) or teacher feedback (e.g., Núñez et al., 2015). Given the purpose of the current study, the research findings related to the teacher feedback will be described. Teacher feedback has been investigated using global measures of homework feedback practices (e.g., Xu & Wu, 2013; Xu et al., 2017) or specific types of feedback as homework control (e.g., Trautwein & Ludtke, 2007; Trautwein et al., 2009) and checking homework completion, checking homework on the board, grading homework, praise, constructive criticism (e.g., Cunha et al., 2019).

Teacher homework feedback provided to students from the eighth and eleventh grade was positively associated with homework completion (Xu, 2011) and with homework management, which includes arranging the environment (e.g., finding a quiet place), managing time, (e.g., planning ahead), handling distraction (e.g., stopping homework to send instant messaging), monitoring motivation (e.g., making homework more interesting), and controlling emotion (e.g., calming down) (Xu & Wu, 2013; Xu et al., 2017). Additionally, teacher homework feedback delivered to students from the tenth and eleventh grade was positively associated with emotion management in mathematics homework, this is, with students' initiative to downregulate unpleasant emotions and upregulate positive emotions (Xu, 2018). Tas et al. (2016), found a positive relationship between seventh-grade students' perceptions of teachers' homework feedback and their homework self-regulation in science, which included homework goal orientations (i.e. mastery, performance, and work-avoidance), homework strategy use (i.e. deep learning and management), and homework procrastination. In addition, with a sample of students from the fifth, sixth and high school Núñez et al. (2015) found that teacher's homework feedback as perceived by students was positively and significantly related to the amount of homework completed and to the perceived quality of homework time management, but it was not related to the amount of time spent on homework.

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Regarding homework control reported by teachers of students from the eighth grade, learning French as their second language was associated with low homework effort and more negative homework emotions from the students (Trautwein et al., 2009). However, homework control perceived by students from the eighth and ninth grade is differently related to homework effort and homework time across six subjects (Trautwein & Ludtke, 2007, 2009). For example, Trautwein and Ludtke (2009) found a mixed pattern of predictive effects of homework control; at class level, data has shown positive statistically significant effects in three (mathematics, German and history) of the six school subjects investigated, but not on student level. In the research by Trautwein et al. (2006) with students from the eighth grade of mathematics and English, a statistically nonsignificant negative effect emerged at the class level, indicating that high homework control does not predict higher overall class effort on homework. At the student level, however, teacher homework control had a statistically significant positive effect on homework effort; in other words, those students in a class who perceived a higher degree of homework control than their classmates, reported putting more effort into their homework (Trautwein et al., 2006). Perceived homework control tended to be positively related to self-reported effort when operationalized as constructive or informational teacher behavior (e.g., "*Our teacher makes sure that we all try hard on our homework*"), but negatively related or unrelated to homework effort when measures alluded to controlling teacher responses (e.g., "*If we haven't done our French homework, we get into trouble with our teacher*") (Trautwein et al., 2006).

Recently Cunha et al. (2019) analyzed homework feedback through different measures (checking homework completion, checking homework on the board, grading homework, praise, constructive criticism) perceived by six-grade students in mathematics subject. These five types of feedback were related to school engagement, which comprised three main dimensions: i) behavioral (students' actions to apply effort, attention, and persistence during curricular and extracurricular activities); ii) cognitive (students' efforts to achieve their learning goals, for example, using self-regulation strategies, which comprises three phases: planning, execution and evaluation; Rosário, 2004); and iii) emotional engagement (students' positive and negative feelings regarding school activities and their sense of belonging) (e.g., Cunha et al., 2019; Fredricks et al., 2004). Results showed checking homework on the board and praise, were perceived by students, as positively related to the three dimensions of student school engagement, such as the willingness to complete their homework assignment and participate in class (i.e. behavioral engagement); use of strategies to complete the school tasks (i.e. cognitive engagement); and experience positive academic emotions (i.e. emotional engagement). Moreover, qualitative findings of this research provided further information. Students reported that checking

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homework completion encouraged them to put more effort into the homework (behavioral engagement), and that they felt satisfaction and pride (emotional engagement) when they were capable of finishing their homework. After the homework has been checked for completion, to verify if it was correct, the students compared it with the solutions presented on the school board (cognitive engagement), using strategies like marks to identify mistakes, that further help them monitor their comprehension and mastery in solving the exercises (cognitive engagement) (Cunha et al., 2019). These findings seem to indicate that students understand the usefulness of homework feedback, which in turn promotes their homework engagement. However, to the best of author's knowledge studies analyzing the relationships between elementary school students' perceived homework feedback usefulness and their homework engagement.

Purpose of the Study

Prior studies showed that students may perceive homework feedback provided by their teacher differently. For example, when teachers regularly check homework, students tend to accomplish more of the task, getting more engaged (Cunha et al., 2018; Trautwein et al., 2006). However, if students perceive homework completion verification as a controlling form of homework feedback, this practice can have the opposite effect (Trautwein et al., 2009). Moreover, the effectiveness of homework feedback and its relationship to outcome variables may depend on whether it is perceived as useful by students (Mouratidis et al., 2010).

Thus, the main aim of this study was to bridge the gap in the literature in relation to the study of perceived homework feedback usefulness (PHFU), relating it to three outcome variables: homework effort (behavioral homework engagement), positive homework emotions (emotional homework engagement) and self-regulation (SR) strategies (cognitive homework engagement). Although, for example, Harks et al. (2014) have studied feedback usefulness perceived by students, to our knowledge, this is the first study to specifically measure this perception in relation to homework feedback, that is, the perceived homework feedback usefulness (PHFU). Grounded on the theoretical model MHM, PHFU is expected to be positively associated with homework effort, with homework emotions and with the use of SR strategies in homework assignments.

Given that variables such as gender and prior achievement predict students' homework engagement (e.g., predicting homework effort, homework emotions) (Rosário et al., 2018, 2019; Trautwein et al., 2009), these will be included in the model. Effectively, female students tend to show more homework effort, use more strategies to complete homework and control negative homework emotions better, in relation to male students (Rosário et al., 2018; Trautwein et al., 2006). Prior

achievement also influence students' involvement in homework (Piñero et al., 2019; Rosário et al., 2018). Lastly, the current study is focused on the domain of mathematics, as teachers typically assign more homework in this subject and report spending more time providing homework feedback in mathematics rather than other domains (Cunha et al., 2018, 2019).

Method

Sample

Per convenience, 12 classes were recruited from one school of the North Region of Portugal. This school has already participated in a prior study of the research group (Cunha et al., 2019); however, the selected classes of the current study participated for the first time. Those 12 classes, five from the 5th grade and seven from 6th grade, were taught by six mathematics teachers (two females; and two with post-grad education) with a mean of 20.83 years of teaching experience ($SD = 4.96$), ranging from 14 to 25; and of 20.33 teaching hours per week ($SD = 1.97$), ranging from 20 to 25.

Participants were 299 students (137 female) from the 5th and 6th grade that did not have special educational needs, with ages ranging from 10 to 13 ($M = 10.78$; $SD = 0.65$), and mathematics grades mean of 3.51 ($SD = .951$; range: [1, 5]). The students from the 5th grade ($n = 125$; 50 female) had ages ranging from 10 to 13 ($M = 10.22$; $SD = 0.49$), and mathematics grades from 2 to 5 ($M = 3.39$; $SD = .957$). The students from the 6th grade ($n = 174$; 87 female) had ages ranging from 11 to 13 ($M = 11.18$; $SD = 0.42$), and mathematics grades from 1 to 5 ($M = 3.59$; $SD = .940$).

Procedure

This study was approved by the Portuguese Ministry of Education. Prior to beginning the data collection, the student's parents signed an informed consent, which explained the goal of the study, as well as its voluntary and confidential character. The students that obtained consent to participate in the study were informed that their participation would be voluntary and that they could decide to decline at any time.

The scales and questionnaires were answered without a teacher present. This data collection was arranged with the teachers and the class directors in order to not interfere with the normal functioning of the class and not coincide with regular evaluation moments.

Measures

Sociodemographic Information

Information regarding sociodemographic data (e.g., age, student gender and class), was collected. This included a question concerning the prior classification achieved in math regarding their previous school year, that varied from 1 to 5 (where 1 and 2 were identified as failure, 3 was identified as a passing grade, 4 as good, and 5 as excellent).

Perceived Homework Feedback Usefulness

To assess the perceived value of homework feedback, the students were given the following prompt “*The correction and comments about the homework, provided by my math teacher, helped me...*” with six items (e.g., “*understand how I can improve*”; “*clarify any doubts or questions I might have*”) rated in a Likert scale from 1 (strongly disagree) to 5 (strongly agree). These items were adapted from Harks et al. (2014). The internal validity of this scale in the current study is good ($\alpha = .83$).

Cognitive Homework Engagement

Homework’s cognitive engagement was assessed through the SRL strategies inventory (based on Cunha et al., 2018). This questionnaire is comprised of six items relating homework or study at home concerning the three phases of the SR process: planning (e.g., “*I make a plan before I begin working in mathematics. I think about what I want to do and how I need to complete it.*”), execution (e.g., “*If I become distracted or loose concentration while I am in mathematics class or studying, then I try hard to focus on the task to achieve my goals.*”), and evaluation (e.g., “*I compare the marks and grades I received with the goals I set for mathematics.*”). These items were rated according a 5-point Likert scale from 1 (never) to 5 (always). Cronbach’s alfa in a prior study was .79 (Cunha et al., 2018), however with the sample of the current research the Cronbach’s alfa is .59.

Behavioral Homework Engagement

Homework’s behavioral engagement was assessed through the homework effort scale (Dettmers et al., 2010; Rosário et al., 2018), which contains four items (e.g., “*I do my best in my mathematics homework*”; “*I always try to do my complete mathematics homework*”), using a Likert scale from 1 (never) to 4 (always). The internal validity of this scale in the current study is good ($\alpha = .71$).

Emotional Homework Engagement

The homework's emotional engagement was assessed by the positive homework emotions scale (Cunha et al., 2018), which assesses the positive emotions regarding homework. It is comprised by 4 items, two items portray enjoyment (e.g., "The material we deal with in math is so exciting that I really enjoy my homework") and another two pride (e.g., "When doing math homework, I think I can be proud of my knowledge"). These items were rated using a 5-point Likert scale from 1 (never) to 5 (always). The internal validity of this scale in the current study is good ($\alpha = .79$).

Data Analysis

The current study aimed to analyze the relationships between perceived homework feedback usefulness (PHFU, i.e. independent variable) and the three dimensions of homework engagement (i.e. dependent variables), controlling the predictive effects of two covariates (i.e. gender and prior achievement). As dimensions of engagement are interrelated (e.g., Cunha et al., 2019; Sinatra et al., 2015), a multivariate regression model was run, as this analysis considers more than one dependent variable and the correlations between them (e.g., Finch & Finch, 2017). In this multivariate regression model, the mentioned covariates were added. Firstly, exploratory data analysis was performed to confirm assumptions of normal distribution. All analyses were run using IBM SPSS Statistics 26.

Results

Descriptive Statistics and Correlations

Table 1 provides the descriptive statistics and the Pearson correlation matrix corresponding to the variables of interest to the current study. Only statistically significant relationships will be reported hereafter.

Table 1

Pearson Correlation Coefficients and Descriptive Statistics (N = 299)

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
X ₁	-	.470**	.531**	.638**	-.118*	.393**
X ₂		-	.398**	.536**	-0.052	.273**
X ₃			-	.562**	-.051	.551**
X ₄				-	-.021	.366**
X ₅					-	.019
X ₆						-
<i>M</i>	4.283	4.025	3.493	3.920	0.540	3.510
<i>SD</i>	0.644	0.681	0.515	0.837	0.499	0.951

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X1 = Perceived homework feedback usefulness; X2 = Cognitive homework engagement; X3 = Behavioral homework engagement; X4 = Emotional homework engagement; X5 = Student gender; X6 = Prior mathematics achievement. All variables are measured on the same scale (minimum = 1, maximum = 5), except homework behavioral engagement (minimum = 1, maximum = 4) and student gender (female = 0; male = 1). When one variable is dichotomous (X5; 0,1) and the other variables are continuous, a Pearson correlation is equivalent to a point biserial correlation

* $p < .05$; ** $p < .01$

Perceived homework feedback usefulness (PHFU) was positively correlated with cognitive ($p < 0.001$), behavioral ($p < 0.001$), and emotional ($p < 0.001$) homework engagement, as well as with prior mathematics achievement ($p < 0.001$). However, it was negatively correlated with student gender ($p = 0.04$), which indicates that higher PHFU is associated to female students.

Prior mathematics achievement was also positively correlated with cognitive ($p < 0.001$), behavioral ($p < 0.001$) and emotional homework engagement ($p < 0.001$). Cognitive engagement was positively correlated with behavioral ($p < 0.001$) and emotional ($p < 0.001$) homework engagement and the last two were also positively correlated ($p < 0.001$).

Multivariate Regression Model

Not all tests of exploratory data analysis allowed to confirm normal distribution. However, considering the central limit theorem, normal distribution can be assumed in large samples; samples of 100 participants presents better normal distribution than samples comprised of 30 participants (e.g., Field, 2013). For this reason, normality can be assumed in the current study ($N = 299$). All assumptions required for running multivariate regression analysis were confirmed, and the results are presented hereafter.

Table 2 provides the estimates data for the multivariate regression model that included perceived homework feedback usefulness (PHFU) as fixed factor (independent variable), behavioral, cognitive and emotional homework engagement (dimensions of homework engagement as dependent variables), and gender and prior achievement as covariates.

The model is statistically significant, controlling for gender and prior achievement, $V = 0.56$, $F(63, 810) = 2.97$, $p < .001$, $\eta^2_p = .19$. Gender is not statistically related to any of the dimensions of homework engagement: behavioral: $F(1, 293) = 0.34$, $p = .560$, $\eta^2_p = .001$; cognitive: $F(1, 293) = 0.12$, $p = .7251$, $\eta^2_p = .000$; and emotional: $F(1, 293) = 0.89$, $p = .347$, $\eta^2_p = .003$. Prior achievement is related to behavioral ($F(1, 293) = 57.56$, $p < .001$, $\eta^2_p = .176$) and emotional ($F(1, 293) = 3.96$, $p < .05$, $\eta^2_p = .014$) homework engagement, but not to cognitive homework engagement ($F(1, 293) = 1.90$,

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$p = .169$, $\eta^2_p = .007$). Perceived homework feedback usefulness (PHFU) is positively related to behavioral ($F(21, 293) = 4.23$, $p < .001$, $\eta^2_p = .248$), cognitive ($F(21, 293) = 3.37$, $p < .001$, $\eta^2_p = .208$) and emotional ($F(21, 293) = 8.16$, $p < .001$, $\eta^2_p = .389$) engagement during homework completion. For behavioral homework engagement, this model explained 44% of variance ($R^2A = .435$); for cognitive homework engagement explained 21% of variance ($R^2A = .205$), and for emotional homework engagement explained 43% of variance ($R^2A = .425$).

Table 2

Estimates Data for the Multivariate Regression Model

	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	IC 95%		η^2_p
					Lower	Upper	
CHE							
Intercept	4.165	.200	20.868	.000	3.772	4.558	.618
Student gender	-.026	.074	-.352	.725	-.172	.120	.000
Prior achievement	.059	.043	1.378	.169	-.025	.144	.007
PHFU_1	-1.865	.633	-2.947	.003	-3.112	-.619	.031
PHFU_2	-1.604	.451	-3.557	.000	-2.492	-.716	.045
PHFU_3	-1.397	.373	-3.743	.000	-2.132	-.662	.049
PHFU_4	-.663	.445	-1.491	.137	-1.540	.213	.008
PHFU_5	-1.115	.369	-3.018	.003	-1.842	-.387	.033
PHFU_6	-2.104	.451	-4.665	.000	-2.992	-1.216	.075
PHFU_7	-.842	.373	-2.255	.025	-1.577	-.107	.019
PHFU_8	-.592	.230	-2.570	.011	-1.045	-.138	.024
PHFU_9	-.422	.323	-1.305	.193	-1.058	.215	.006
PHFU_10	-1.284	.625	-2.054	.041	-2.515	-.053	.015
PHFU_11	-.651	.239	-2.728	.007	-1.122	-.181	.027
PHFU_12	-.644	.239	-2.691	.008	-1.115	-.173	.026
PHFU_13	-.513	.184	-2.788	.006	-.875	-.151	.028
PHFU_14	-.533	.158	-3.370	.001	-.844	-.221	.041
PHFU_15	-.462	.178	-2.605	.010	-.812	-.113	.025
PHFU_16	-.271	.143	-1.889	.060	-.554	.011	.013
PHFU_17	-.769	.621	-1.238	.217	-1.991	.454	.006
PHFU_18	-.165	.149	-1.105	.270	-.459	.129	.005
PHFU_19	-.134	.448	-.299	.765	-1.015	.747	.000
PHFU_20	-.118	.144	-.815	.416	-.402	.167	.002
PHFU_21	-.164	.139	-1.179	.240	-.437	.110	.005
PHFU_22	0 _a	.	.	.	.	.	.
BHE							
Intercept	3.009	.127	23.616	.000	2.758	3.260	.675
Student gender	-.028	.047	-.584	.560	-.121	.066	.001
Prior achievement	.208	.027	7.587	.000	.154	.262	.176
PHFU_1	-.440	.404	-1.088	.278	-1.235	.356	.004
PHFU_2	-1.162	.288	-4.035	.000	-1.728	-.595	.057

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PHFU_3	-.976	.238	-4.097	.000	-1.446	-.507	.059
PHFU_4	-.245	.284	-.862	.389	-.804	.314	.003
PHFU_5	-.509	.236	-2.158	.032	-.973	-.045	.017
PHFU_6	-.537	.288	-1.864	.063	-1.103	.030	.013
PHFU_7	-.976	.238	-4.097	.000	-1.446	-.507	.059
PHFU_8	-.583	.147	-3.966	.000	-.872	-.293	.055
PHFU_9	-.352	.206	-1.708	.089	-.759	.054	.011
PHFU_10	-1.092	.399	-2.737	.007	-1.878	-.307	.027
PHFU_11	-.464	.152	-3.041	.003	-.764	-.163	.033
PHFU_12	-.417	.153	-2.728	.007	-.717	-.116	.027
PHFU_13	-.474	.117	-4.036	.000	-.705	-.243	.057
PHFU_14	-.379	.101	-3.755	.000	-.578	-.180	.050
PHFU_15	-.302	.113	-2.664	.008	-.525	-.079	.026
PHFU_16	-.073	.092	-.801	.424	-.254	.107	.002
PHFU_17	-.022	.396	-.057	.955	-.803	.758	.000
PHFU_18	-.277	.095	-2.909	.004	-.465	-.090	.030
PHFU_19	-.641	.286	-2.243	.026	-1.203	-.078	.018
PHFU_20	-.095	.092	-1.028	.305	-.276	.087	.004
PHFU_21	-.012	.089	-.132	.895	-.186	.163	.000
PHFU_22	0 ^a	.	.	.	.	.	.
EHE							
Intercept	4.069	.208	19.576	.000	3.659	4.478	.588
Student gender	.073	.077	.943	.347	-.079	.225	.003
Prior achievement	.089	.045	1.987	.048	.001	.177	.014
PHFU_1	-2.730	.659	-4.142	.000	-4.028	-1.433	.060
PHFU_2	-2.658	.470	-5.659	.000	-3.583	-1.733	.106
PHFU_3	-1.519	.389	-3.908	.000	-2.285	-.754	.054
PHFU_4	-1.997	.463	-4.310	.000	-2.909	-1.085	.065
PHFU_5	-1.771	.385	-4.606	.000	-2.528	-1.014	.073
PHFU_6	-2.658	.470	-5.659	.000	-3.583	-1.733	.106
PHFU_7	-1.491	.389	-3.836	.000	-2.257	-.726	.052
PHFU_8	-1.338	.240	-5.583	.000	-1.810	-.866	.104
PHFU_9	-.787	.337	-2.339	.020	-1.450	-.125	.020
PHFU_10	-1.580	.651	-2.427	.016	-2.861	-.298	.021
PHFU_11	-.760	.249	-3.057	.002	-1.250	-.271	.034
PHFU_12	-.937	.249	-3.758	.000	-1.427	-.446	.050
PHFU_13	-1.082	.192	-5.645	.000	-1.459	-.704	.106
PHFU_14	-.838	.165	-5.093	.000	-1.162	-.514	.088
PHFU_15	-.592	.185	-3.202	.002	-.956	-.228	.037
PHFU_16	-.331	.149	-2.216	.028	-.625	-.037	.018
PHFU_17	-.836	.646	-1.294	.197	-2.109	.437	.006
PHFU_18	-.402	.156	-2.586	.010	-.709	-.096	.024
PHFU_19	-.827	.466	-1.776	.077	-1.745	.090	.012
PHFU_20	-.103	.150	-.686	.493	-.399	.193	.002
PHFU_21	-.012	.145	-.082	.935	-.296	.273	.000
PHFU_22	0 ^a	.	.	.	.	.	.

CE = Cognitive homework engagement; BE = Behavioral homework engagement; EE = Emotional homework engagement;

PHFU = Perceived homework feedback usefulness; _1 = mean 1.00; _2 = mean 2.17; _3 = mean 2.33; _4 = mean 2.50;

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_5 = mean 2.67; _6 = mean 2.83; _7 = mean 3.00; _8 = mean 3.17; _9 = 3.33; _10 = mean 3.40; _11 = mean 3.50; _12 = mean 3.67; _13 = mean 3.83; _14 = mean 4.00; _15 = mean 4.17; _16 = mean 4.33; _17 = mean 4.40; _18 = mean 4.50; _19 = mean 4.60; _20 = mean 4.67; _21 = mean 4.83; _22 = mean 5.00

0: This parameter is set to zero because it is redundant.

Discussion

The main aim of this study was to bridge the gap in the literature regarding the study of perceived homework feedback usefulness (PHFU), relating it to three outcome variables: homework effort (behavioral homework engagement), positive homework emotions (emotional homework engagement) and self-regulation (SR) strategies used in homework assignments (cognitive homework engagement). The results showed that, controlling the predictive effects of two covariates (i.e. gender and prior achievement), PHFU was positively related to behavioral, cognitive, and emotional engagement during homework completion.

Thus, as expected, this study showed that PHFU predicted more homework effort, more positive homework emotions and a higher use of SR strategies in homework assignments. In fact, according to the theoretical framework followed (Multilevel Homework Model; MHM), teachers' related variables such as homework control, predict students' homework motivation variables (expectancy and value beliefs), which in turn, predict homework effort, homework emotions and (meta)cognitive learning strategies used by students (Dettmers et al., 2011; Trautwein et al., 2006). However, while in relation to the homework control there are both positive, negative, and null relationships with engagement (e.g., Trautwein & Ludtke, 2007, 2009), in the current study positive relationships were found with the PHFU. In this sense, this study adds an important variable to the group related to teachers' practices in the MHM. Furthermore, the results are aligned with Deci and Ryans' theory (2000), according to which the impact of external events (such homework feedback) on students' intrinsic motivation and engagement will only occur if students are interested in or value the given task (Deci & Ryan, 1985, 2000; Ryan & Deci, 2000, 2002; Reeve, 2012). Gathering these arguments, it is likely that students who perceive homework feedback as useful, create more positive beliefs about it and, consequently, become more engaged in their homework assignments (Deci & Ryan, 200; Trautwein et al., 2006), that is, increase their homework effort, have more positive homework emotions and use more SR strategies (Dettmers et al., 2011; Trautwein et al., 2006). Given that, to our knowledge, this was the first study to specifically measure the usefulness in relation to homework feedback, that is, PHFU, to frame the results in the literature, we supported ourselves on studies about the most similar variable, that is, perceived feedback usefulness.

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Even though it was regarding college students and in relation to their writing, in Ekholm et al. (2015), participants with more positive perceptions of feedback reported higher writing self-regulation aptitude than the participants with more negative feedback perceptions. Process-oriented feedback (which is related to the homework feedback measured in the current study) has been perceived by students as more useful than grade-oriented (Harks et al., 2014; Rakoczy et al., 2013). The perceived usefulness of process-oriented feedback was associated with more interest and self-efficacy (Harks et al., 2014; Rakoczy et al., 2013, 2019). If we consider that feedback perceived as useful responds to three major questions: “Where am I going?”, “How am I going?”, and “Where to next?” (Hattie & Timperley, 2007) and that it addresses the ways in which students monitor, direct, and regulate their own actions toward reaching a learning goal (Rakoczy et al., 2013), it is more likely that feedback helps students to understand their mistakes and identify strategies to proceed (Narciss, 2008). These results, in conjunction with the present study, suggest a close relationship between PHFU by students and the use of SR strategies in their mathematics homework.

As mentioned, a relationship was also found between PHFU and the positive homework emotions. Similarly, in Ryan and Henderson (2018), students more likely to perceive the feedback comments they generally receive to be upsetting, and too critical, were the students to experience more negative emotional reactions, which included sadness, shame and anger. In another study, students expressed frustration and dissatisfaction about feedback when the improvement they should make was not spelt out clearly or was not immediately applicable in subsequent work (Price et al., 2010).

Regarding homework effort, in the literature review, there was an inconsistency in the predictive effect of the homework feedback (Trautwein & Ludtke, 2007, 2009). Specifically, the homework control tends to be positively related to student’s homework effort when operationalized as constructive or informational teacher behavior, but negatively related or unrelated to homework effort when measures allude to controlling teacher responses (Trautwein et al., 2006). Therefore, the positive relationship found between PHFU and homework effort demonstrates the importance of homework feedback being perceived by students as favorable and useful for behavioral homework engagement.

In fact, the three dimensions of homework engagement were intercorrelated, which is in line with the literature (e.g., Cunha et al., 2019; Sinatra et al., 2015), because both cognition and emotions influence human behaviors (Pessoa, 2008) and there is evidence that the emotional engagement predicts future behavioral engagement (Skinner et al., 2008). This dynamic interaction is also assumed by Zhang and Hyland (2018) which concluded that “engaged learners tend to spend more time working with feedback, show more positive attitudes toward it, and employ more revising strategies” (p. 100). Thus, if

homework feedback is perceived as useful, homework engagement is expected to be greater, not only because PHFU was related to each dimension (cognitive, behavioral and emotional), but also because they are interrelated, so if there is an increase in one, it is likely that the rest will also increase (e.g., Cunha et al., 2019; Sinatra et al., 2015; Skinner et al. 2008).

However, PHFU was related to cognitive homework engagement with lower effect size ($\eta^2_p = .208$), compared with behavioral ($\eta^2_p = .248$) and emotional ($\eta^2_p = .389$) homework engagement. Also, in the model, the explained variance for cognitive engagement (21%) was lower than for behavioral (44%) and emotional (43%) homework engagement. On the other hand, PHFU was related to emotional homework engagement with the biggest effect size. PHFU here analyzed measures if the correction and comments about the homework, provided by math teacher, helps students identify and correct errors, clarify any doubts or questions they might have and understand how they can improve, which type of contents they have to practice and the material covered in class. These comments do not seem to focus on the homework planification phase (e.g., "*I make a plan before I begin working in mathematics*"), which is included in the SR process (cognitive engagement). We can assume that corrections and comments are more focused in the execution and evaluation of the task. If students have more information on how to improve the task, it is more likely that they will put effort on their homework assignments (see Cunha et al., 2019; Xu, 2016). Additionally, just as mentioned above, there is a relation between the feedback being perceived as useful and student's self-efficacy (Harks et al., 2014; Rakoczy et al., 2013, 2019). Thus, having students confidence in the ability to do their homework, they are likely to experience positive homework emotions, such as pride and enjoyment. Consequently, PHFU appears to have a greater implication in the positive homework emotions (emotional engagement) and less in the cognitive homework engagement.

Nevertheless, with the statistical model found here, a large effect size ($\eta^2_p = .19$) was obtained ($\eta^2_p \geq .138$; $d \geq .80$; Cohen, 1988). Still, given that gender and previous achievement predicted students' homework engagement in previous research (Piñero et al., 2019; Rosário et al., 2018, 2019; Trautwein et al., 2006, 2009), these variables were included as covariates to statistically control their predictive effect on the target variables of the model. However, in the present study gender was not related to any of the dimensions of homework engagement. Additionally, in Rosário et al. (2018), a study with six-graded students, did not find a significant association between gender and homework effort. While the present study encompassed five-grade and six-grade students, Trautwein et al. (2006) found that female students showed more homework effort when in eight-grade. Also, in the secondary school level, female students tended to control their negative homework emotions better (Xu, 2010). On the other hand, female

students in five-grade and six-grade (same grades as the present study) tended to use more strategies to complete homework (Xu, 2007), but in different subject (English) from the one in the present study. Thus, it seems that the influence of gender on homework may depend on the level of education and the subject in which it is analyzed. Previous achievement in mathematics was related to behavioral and emotional homework engagement and was positively correlated to the three dimensions of homework engagement, as mentioned in the literature (e.g., Piñero et al., 2019; Rosário et al., 2018) and predicted by Multilevel Homework Model (MHM) (Dettmers et al., 2011; Trautwein et al., 2006).

However, it should be noted that a higher PHFU was associated to female students and to students with best previous achievement. For example, Narciss et al. (2014) showed that girls generally benefited more from feedback than boys, suggesting a difference in how they perceive and subsequently use feedback. In another study, achievement level significantly predicts students' self-efficacy, intrinsic values, and self-regulation, which in turn affected perceptions of feedback quality (van der Kleij, 2019). These results suggest, one more time, that student variables play an important role in determining how feedback is perceived (Trautwein et al., 2006; van der Kleij, 2019).

Implications for Practice

This study provided empirical evidence of the importance of homework feedback being perceived by students as useful (Xu, 2016) as to enhance homework engagement (Dettmers et al., 2011; Trautwein et al., 2006). As Price et al. (2011) stated: "where students become disillusioned with the usefulness of feedback for their learning, their disengagement becomes obvious" (p. 888).

Winstone et al. (2017) review tells us that there has been a greater emphasis, in literature, on the students' role regarding teacher feedback, which is considered a bidirectional process, that is, a teacher-student dialogue. Thus, and taking into account the results of this study, it becomes relevant for teachers to consider the feedback that students provide them (Richardson, 2005; Hattie & Gang, 2011), namely in relation to how they perceive homework feedback. In this sense, teachers can have conversations/discussions with students (e.g., Cunha et al., 2019; Kyaruzi et al., 2019) about how students are perceiving homework feedback, so that they can adapt it to the students' needs. In fact, results of a study show that when students are aware of the learning goals perceive teachers' feedback practice as more useful (Vattøy & Smith, 2019). Therefore, it is imperative that teachers take these and other aspects (e.g., if homework feedback answers to three major questions mentioned above) into account so that homework feedback is perceived as useful by the students and, consequently, become more engaged with their homework.

In addition, despite not being the focus of this study, it seems that, in the 5th and 6th grades and in the subject of mathematics, gender did not influence student engagement. However, female students perceived homework feedback as more useful. This result indicates that, in the discussions proposed above, a special attention may be needed by the teachers towards the perception of male students, to show them homework feedback usefulness. Special attention is also deserved by teachers towards students with lower prior achievement, since they are likely to have low self-efficacy and self-regulation (van der Kleij, 2019), which in turn affect their perceived homework feedback usefulness (PHFU) and homework engagement. Effectively, students who received grades lower than they expected on a particular assessment task were more likely to feel sad, shameful and angry as a result of the feedback comments, than students who received grades higher than they expected (Ryan & Henderson, 2018).

Limitations and Future Research

Despite the relevance of this study and the resulting practical implications, there are some limitations. For example, the data was collected only through self-report questionnaires. According to Swann et al. (2007), naturally settings have more influencing factors of outcome variables than controlled environments. Thus, future studies can complement data collection through interviews to understand how students perceive homework feedback usefulness and classroom observations to further assess the way students demonstrate their homework engagement.

Additionally, two covariate variables were also considered: gender and previous achievement. However, there may be other variables influencing the model, as may be the case with self-efficacy (Ekholm et al., 2015). In this sense, future studies can test the effect of the third variable, not only in relation to the three dimensions of homework engagement, but also in relation to perceived homework feedback usefulness (PHFU). That is, it would be interesting for future studies to find variables that may be mediating / moderating PHFU, in order to understand which variables we can intervene to enhance PHFU and, consequently, homework engagement. For example, feedback provided long after the work was done was not seen as useful by students (Price et al., 2011).

Furthermore, this study only related PHFU with three outcome variables, anchored in the homework feedback literature (e.g., Cunha et al., 2019; Trautwein et al., 2009; Xu et al., 2017) and in the MHM (Dettmers et al., 2011; Trautwein et al., 2006). It would be interesting for future studies to relate this variable to the remainder of the model, such as achievement (Trautwein et al., 2006).

In the present study, the PHFU was measured against an global measure of homework feedback (*"The correction and comments about the homework, provided by my math teacher, helped me..."*).

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Future studies could evaluate the PHFU in relation to different types of feedback (see Cunha et al., 2019). In this way, it will be possible to see if some type of feedback is perceived as more useful than others. More importantly, it can be concluded if the PHFU predicts homework engagement, whatever the type of homework feedback given.

Finally, this study fulfills the research gap, because PHFU has been neglected, especially at elementary school level. However, the sample being collected through convenience is a limitation. Future studies may replicate this with a larger sample, in different school grades and for different subjects, as results may vary.

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Attachments

Annex A – Authorization by Ministry of Education and Science (Monitoring of School Surveys)

De: mime-noreply@gepe.min-edu.pt [mailto:mime-noreply@gepe.min-edu.pt]
Enviada: terça-feira, 12 de Fevereiro de 2013 15:14
Para: prosario@psi.uminho.pt; prosario@psi.uminho.pt
Assunto: Monotorização de Inquéritos em Meio Escolar: Inquérito nº 0356000001

Exmo(a)s. Sr(a)s.

O pedido de autorização do inquérito n.º 0356000001, com a designação *Questionário de avaliação do envolvimento de Alunos, Pais Professores nos Trabalhos de Casa na disciplina de Matemática*, registado em 29-01-2013, foi aprovado.

Avaliação do inquérito:

Exmo(a) Senhor(a) Dr(a) Pedro Rosário
Venho por este meio informar que o pedido de realização de inquérito em meio escolar é autorizado uma vez que, submetido a análise, cumpre os requisitos, devendo atender-se às observações aduzidas.
Com os melhores cumprimentos
José Vitor Pedroso
Diretor de Serviços de Projetos Educativos
DGE