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Student perceptions of homework feedback quality: do homework purpose, effort, and management matter?

Jianzhong Xu[1], Süleyman Avcı[2], Mustafa Özgene[1,3] & José Carlos Núñez[4,*]

[1] *Mississippi State University, Mississippi State (USA)*
[2] *Marmara University, Istanbul (Türkiye)*
[3] *Istanbul Sabahattin Zaim University, Istanbul (Türkiye)*
[4] *University of Oviedo, Oviedo (Spain)*

Keywords

Feedback quality
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Autonomy support

Abstract

This study examined the extent to which the perceived quality of teacher feedback is related to homework purpose, effort, and management, after controlling for key variables identified in previous studies. Multilevel models were used to analyze the responses of 1,426 students in grades 5-8 from 74 classrooms in Turkey. At the student level, perceived feedback quality showed positive associations with teacher autonomy support, homework quality, academic purpose, effort, and management. At the class level, it was positively related to autonomy support and homework quality. The results point to the nuanced nature of the homework process, tentatively suggesting that academic purpose may serve as a more proximal lens for interpreting feedback, whereas approval-seeking and self-regulatory purposes might shape feedback perceptions indirectly, via their associations with homework effort and management. Taken together, these results imply that strengthening students' academic purpose, effort, and management may be crucial for fostering constructive engagement with homework feedback. Importantly, this study extended previous research by revealing that perceived feedback quality was positively associated with academic purpose, effort, and management after considering other theoretically relevant variables in multilevel models. Practices such as designing purposeful homework, emphasizing effort, promoting self-regulatory capacities, and incorporating students' perspectives on effective feedback may help learners view feedback as

Percepción de los estudiantes de la calidad de la retroalimentación sobre las tareas escolares: el rol del propósito, el esfuerzo y la gestión de las tareas

Palabras clave

Calidad de la retroalimentación
Tareas escolares
Propósitos
Esfuerzo
Gestión de las tareas
Apoyo a la autonomía

Resumen

Este estudio examinó el grado en que la calidad percibida de la retroalimentación docente se relaciona con los propósitos, el esfuerzo y la gestión de las tareas escolares. Se utilizaron modelos multinivel para analizar las respuestas de 1,426 estudiantes de 5º a 8º curso de 74 clases en Turquía. A nivel de estudiante, la calidad percibida de la retroalimentación mostró asociaciones positivas con el apoyo a la autonomía docente, la calidad de las tareas, el propósito académico, el esfuerzo y la gestión de las tareas. A nivel de clase, se relacionó positivamente con el apoyo a la autonomía y la calidad de las tareas. Los resultados apuntan a la naturaleza dinámica del proceso de realización de las tareas, lo que podría sugerir que los propósitos académicos pueden servir como una perspectiva más cercana para interpretar la retroalimentación del profesorado, mientras que la búsqueda de aprobación y los propósitos de autorregulación podrían influir indirectamente en las percepciones de esa retroalimentación a través de su asociación con el esfuerzo y la gestión de las tareas escolares. En conjunto, estos resultados implican que fortalecer el propósito, el esfuerzo y la gestión académica de los estudiantes puede ser crucial para fomentar una participación constructiva en la retroalimentación sobre las tareas. Prácticas como diseñar tareas con propósitos claros, enfatizar el esfuerzo, promover la autorregulación e incorporar las perspectivas de los estudiantes sobre la retroalimentación efectiva pueden ayudar a los estudiantes a percibir la retroalimentación como más útil, informativa y de mayor calidad.

* *Corresponding author:* José Carlos Núñez. Faculty of Psychology, University of Oviedo, Plaza Feijoo, s/n, 33003, Oviedo, Asturias, Spain. jcarlosn@uniovi.es
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Homework, defined as tasks teachers assign to be completed outside scheduled school hours (Cooper, 1989), has long been a staple of instructional practice worldwide (Rodríguez et al., 2025; Xu et al., 2024). Given that homework is a key activity in students' academic routines, especially in the later years of primary and in secondary education, homework models have been proposed that detail the personal and contextual variables involved in this process (e.g., Trautwein et al., 2006; Xu & Corno, 2022). These models emphasize students' engagement (cognitive, motivational, and emotional), as well as the involvement of teachers and families. One variable that has recently received considerable research attention is the role of students' perceptions of the quality of teacher feedback on homework (Dettmers et al., 2010; Núñez et al., 2015; Xu, 2024b). Students may interpret and respond to homework feedback differently depending on its perceived usefulness and benefit for improving their performance (Cunha et al., 2019; Núñez et al., 2015; Xu, 2024b). In general, higher perceived feedback quality has been linked to greater homework completion (Núñez et al., 2015; Xu et al., 2022) and higher levels of academic achievement (Xu, 2016, 2024b).

Student's perceived teacher feedback

Feedback involves "information provided by an agent… regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 81). It is widely regarded as one of the most influential factors in student achievement, with meta-analyses reporting effect sizes between .7 and .79 (Hattie & Timperley, 2007; Hattie & Zierer, 2019). Recent studies have highlighted that feedback is not intrinsically effective, and its impact depends on how students interpret it and act upon it (Brookhart, 2017; Esterhazy et al., 2020). Specifically, in the homework domain, feedback quality refers to students' evaluative judgments of the usefulness, value, and instructional supportiveness of teacher feedback for completing and improving their homework (Xu, 2024a). This conceptualization reflects formative feedback perspectives, which emphasize feedback as information that helps students move forward in their work (Hattie & Timperley, 2007), and aligns with existing literature underscoring students' perceptions of usefulness and value as central indicators of meaningful feedback uptake (Brookhart, 2018; Carless & Boud, 2018; Winstone et al., 2017). Students' perceptions represent a proximal indicator of whether feedback processes function as intended (Brookhart, 2017). In this regard, Esterhazy et al. (2020) stressed the need to consider the factors influencing how students perceive and use feedback as a core component of high-quality academic work.

Predictors of student's perceived teacher feedback quality

Despite growing interest in feedback quality, few studies have systematically examined why students perceive homework feedback as more –or less– useful. Moreover, current knowledge about perceived homework feedback quality is largely derived from studies that (a) have not systematically examined these factors in relation to feedback quality and (b) have not used a multilevel approach capable of distinguishing individual and classroom level contributions. In addition, existing studies on feedback quality have not been explicitly grounded in contemporary theories or empirical research on feedback. One exception is the recent study by Xu (2024a), which applied multilevel models to predict perceived feedback quality by incorporating both student and classroom level characteristics. However, this study overlooked other potentially significant influences, such as homework purpose, effort, and task management, which theory and prior research suggest may shape students' perceptions of feedback (Dweck & Yeager, 2019; Esterhazy et al., 2020; Nicol & Macfarlane-Dick, 2006; Xu, 2022).

Homework purpose

As expectancy-value theory articulates (Eccles & Wigfield, 2020), students' perceptions of homework purpose –whether to improve learning, develop self-regulatory skills, or gain approval– may determine their motivation and engagement (Sun et al., 2020a; Xu, 2021, 2022) and consequently influence how they interpret homework feedback. Homework purpose reflects students' beliefs about its importance, which guide their initiative, persistence, and receptivity to feedback. Building on foundational work (Epstein & Van Vorhis, 2001) and recent validations (Avcı & Özgenel, 2024b; Sun et al., 2020a, 2020b; Xu, 2021), three distinct purposes have been consistently identified: academic (learning improvement), self-regulatory (cultivating responsibility and study habits), and approval-seeking (meeting external expectations). In line with expectancy-value and self-determination perspectives, incorporating homework purpose enriches our understanding of the homework context by recognizing that students have various reasons for engaging with their homework, which may influence their receptivity to teacher feedback.

Homework effort

Individuals with a growth mindset (Dweck, 2006; Dweck & Yeager, 2019) believe that ability develops through effort. This belief in the power of effort influences how feedback is perceived: rather than viewing it as a threat to their abilities, students see it as an opportunity for improvement, making them more receptive to feedback, more actively engaged with it, and more likely to perceive it as relevant, high-quality, and beneficial for their development. Thus, perceived feedback quality functions as an evaluative judgment shaped by students' mindsets.

Homework management

There is little doubt that motivation and self-regulation in homework management influence how students evaluate and use feedback. Research suggests that when students are confident in their abilities and perceive a task as valuable, they tend to be more receptive to feedback and perceive it as higher quality (Van der Kleij, 2019; Zumbrunn et al., 2016). Individuals

with higher self-regulation are more skilled at goal setting and self-evaluation, which may enhance their receptivity to teacher feedback, their ability to apply it constructively, and their perception of its quality in meeting their learning needs (Winstone et al., 2017; Xu, 2024a).

The present study

The data this study provides may offer valuable insights for a number of reasons. First, it aims to examine the extent to which perceived feedback quality is associated with homework purposes, effort, and management, in addition to the key variables identified in prior research (e.g., Xu, 2024a), variables that have received limited attention in previous studies. Given theoretical perspectives that emphasize the role of purpose, effort, and homework management in shaping feedback perceptions (Dweck & Yeager, 2019; Esterhazy et al., 2020), and the scarcity of existing data on these issues, there is an urgent theoretical and practical need to address this gap in the literature. Second, this gap is addressed through multilevel modelling, as homework represents a classic multilevel context requiring the separation of individual and classroom level effects (Elawar & Corno, 1985; Trautwein et al., 2006; Trautwein et al., 2009). The use of a multilevel approach is methodologically superior to analyses conducted solely at the student level, given that the data in our study have a hierarchical structure in which students are nested within classrooms. This multilevel approach allows more precise, valid, theoretically consistent inferences that reflect the hierarchical nature of the collected data (Hox et al., 2018; Snijders & Bosker, 2012). Third, the present study is particularly relevant to secondary school mathematics homework, where students report greater challenges (Rosário et al., 2018; Xu et al., 2024a) and teachers generally assign more homework and provide more feedback (Cunha et al., 2019; Rønning, 2011; Xu, 2015). Moreover, mathematics is closely related to other important disciplines students' study (e.g., science, technology).

Accordingly, drawing on self-regulation theory (Winstone et al., 2017; Zimmerman, 2005) and prior research (e.g., Xu, 2016), we hypothesize a positive association between perceived feedback quality and homework management. In addition, based on the mindset perspective as a motivational lens (Dweck, 2006; Dweck & Yeager, 2019) and supporting evidence (e.g., Yang & Xu, 2019), we expect a positive relationship between perceived feedback quality and homework effort. However, unlike effort and management, the predictive influence of different homework purposes is less clear; therefore, no specific hypotheses are proposed in this regard.

Method

Participants

Our research sampled 1,426 students (46.9% male) in Grade 5 to 8 from 74 classes across ten regular public schools in southwestern Türkiye, selected to reflect diverse socioeconomic contexts. This sample aligns with recommendations for multilevel modeling, which suggests at least 50 groups with approximately 20 participants each (Raudenbush & Bryk, 2002). The targeted grade levels reflect the typical four-year middle school structure in Türkiye. Participants' mean age was 12 years (SD =1.1). Participants followed standard educational practices in Türkiye, attending six weekly 40-minute mathematics classes in Grades 5-6 and five in Grades 7-8. Parent involvement in homework is encouraged but discretionary. Students spent an average of 84 minutes per week on mathematics assignments (SD = 58), aligning with prior studies on homework practices in Türkiye (Avcı & Özgenel, 2025).

Fathers averaged 9.4 years of education (SD = 4.1), and mothers averaged 8.4 years (SD = 4.2), closely aligning with Türkiye's national average of 9.3 years of education (TUIK, 2024).

Procedure

Institutional review board approval was obtained for this study (No: 2024/4). To minimize response bias, survey was administrated during regular hours without teachers present. The response rate was 99.4%.

Measure

Independent variables

Parent education was coded in years: no schooling (0), primary school (4), secondary school (8), high school (12), associate degree (14), bachelor's degree (16), master's degree (18), and doctorate (20). Given the strong correlation between paternal and maternal education (r = .88, p < .001), the two were averaged to form a composite score. Students' mathematics achievement scores measured five months earlier were included as a covariate to account for prior learning.

Validated scales were administrated. They were previously validated in work from Türkiye and China (e.g., Avcı & Özgenel, 2024a, 2024b; Sun et al., 2020b; Xu, 2016, 2021). They all have Likert-type measurement scales: homework expectancy, homework value, academic purpose, self-regulatory purpose, approval-seeking purpose, and homework effort (1 = *Strongly disagree* to 4 = *Strongly agree*) and homework quality, autonomy support, homework management, and teacher feedback (1 = *Never* to 5 = *Always*).

Homework Expectancy Value Scale. It comprised two subscales (Avcı & Özgenel, 2024b; Xu, 2017; Yang & Xu, 2018): homework expectancy (4-item; e.g., "If I don't understand something in mathematics, I often think I'll never understand it"; reverse-scored), and homework value (4-item; e.g., "I don't learn much from our mathematics homework"; reverse-scored). In this study, homework expectancy (α and ω = .79) and value (α and ω = .82) were factorially distinguishable (RMSEA = .06; CFI = .97; SRMR = .03).

Homework Quality. This four-item measure (Xu, 2016) assessed participants' perceptions of the extent to which mathematics tasks are planned, selected, and aligned with

instructional content. An example of these items is "Our math homework assignments really help us to understand our math lessons." The scale's reliability is good (α and ω = .84).

Autonomy Support. This four-item scale (Xu, 2016) evaluated the degree to which teachers acknowledged participants' initiative for approaching mathematics homework and encouraged their independent involvement. An example of these items is "My mathematics teacher encourages me to ask questions about homework assignments." The reliability of the scale is very good (α and ω = .87).

Homework Purpose Scale. This scale included three subscales (Avcı & Özgenel, 2024b; Sun et al., 2020a, 2020b; Xu, 2021): academic purpose (4-item; promoting mathematics learning), self-regulatory purpose (3-item; fostering desirable study habits), and approval-seeking (3-item; gaining approval from family, teachers, and peers). In this study, academic purpose (α and ω = .85), self-regulatory purpose (α and ω = .8), and approval-seeking purpose (α and ω = .69) were factorially distinct (RMSEA = .07; CFI = .95; SRMR = .036).

Homework Effort. This four-item scale (Avcı & Özgenel, 2024a) assessed the degree to which students diligently and seriously worked on mathematics homework. An example of such an item is "I do my best in mathematics homework." The reliability of the scale in this study is good (α and ω = .84).

Homework Management. It included 22 items (Xu et al., 2025; Xu et al., 2017; Xu & Wu, 2013) assessing the extent to which students structured homework environment, managed time, monitored motivation, coped with emotions, and handled distractions. An example of these items is "Keep track of what remains to be done." The reliability of the scale in this study is very good (α and ω = .87).

Dependent variable

Feedback Quality. It contained four items (Xu, 2016) assessing student perceptions of teacher feedback on mathematics homework, focusing on its usefulness, value, and instructional support for completing homework tasks. An example of such an item is "The feedback I receive from my math teacher helps me do my work." The reliability of the scale in this study is good (α and ω = .84). This operationalization is consistent with the functional role of feedback in homework contexts, where students rely on feedback as a resource for understanding and improving their work rather than for immediate performance evaluation.

Data analysis

Multilevel modeling with full maximum likelihood estimation was conducted in HLM 8.2 to address data nesting. Continuous variables were standardized to facilitate comparison of coefficients typically used in traditional multiple regression analyses.

Model 1 introduced seven individual-level variables (gender, parent education, prior knowledge, homework expectancy, value, quality, and autonomy support) and three class-level variables (grade, homework quality, and autonomy support). The class-level homework quality and autonomy support variables were created by aggregating students' ratings within each class, capturing shared classroom perceptions. To examine the predictive effects of homework purpose, effort, and management, Model 2 added five additional variables at the individual level – homework purposes (academic, self-regulatory, approval-seeking), effort, and management.

Models 1 and 2 used a random-intercept framework, given the absence of hypotheses about individual-level predictor variability across classes. To differentiate individual and compositional effects, we applied group-mean centering to homework quality and autonomy support for individual-level analyses, and grand-mean centering for class-level analyses. Missing data was minimal (1.6%) and handled using the expectation-maximization (EM) algorithm. Little's MCAR test was significant, χ^2 (16873) = 19847.59, $p < .001$, indicating that MCAR could not be assumed. We thus examined whether missingness was related to observed variables (e.g., gender and grade); results suggested that missingness was explainable by observed observation, supporting the plausibility of a missing at random (MAR) mechanism. Given the low missingness rate and the plausibility of MAR, EM is expected to yield stable, consistent parameter estimates.

Results

Preliminary analyses

Raudenbush and Bryk (2022) assert that results in multilevel modeling remain unaffected when distributions approximate normality. In this research, skewness and kurtosis values for the Likert-type scales were within -1 to +1, except for autonomy support (skewness = -1.08). Following Miller and Murdock (2007), class-level aggregates (ICC2) for homework quality and autonomy support were assessed. Values of 0.77 and 0.76, respectively, exceeded the 0.6 threshold for satisfactory reliability (Trautwein & Lüdtke, 2009).

Table 1 shows descriptive statistics and correlations between variables. Perceived feedback quality was significantly correlated with all predictors. Multicollinearity was evaluated via Variance Inflation Factor (VIF), with all values below 5 (Shrestha, 2020). The highest observed VIF was 3, indicating no major issues.

Multilevel analyses

The null model showed that 15.9% of the variance in perceived feedback quality was at the class level and 84.1% at the individual level. Intraclass correlations (ICC1) calculated using fully unconditional models with predictors as outcomes, ranged from 0.04 to 0.25: prior knowledge (0.25), parent education (0.16), homework expectancy (0.04), homework value (0.06), homework quality (0.17), autonomy support (0.17), academic purpose (0.11), self-regulatory purpose (0.07), approval-seeking purpose (0.1), homework effort (0.1), and homework manage-

Table 1

Descriptive statistics and correlations

Variables	*M*	*SD*	*S*	*K*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Gender (female = 0; male = 1)	.47	.5	0.05	-1.99	---														
2 Prior mathematics knowledge	64.89	21.74	-0.36	-0.56	-.08**	---													
3 Parent education	8.88	3.68	0.52	-0.29	.03	.26**	---												
4 Homework expectancy	2.75	.88	-0.23	-0.93	.06*	.32**	.07	---											
5 Homework value	2.95	.85	-0.57	-0.53	-.04	.24**	.04	.62**	---										
6 Homework quality	3.96	1.02	-1.02	0.26	-.13**	.37**	.06*	.22**	.32**	---									
7 Autonomy support	3.35	1.28	-0.34	-1.08	-.03	.32**	.07**	.20**	.25**	.59**	---								
8 Academic purpose	2.82	.88	-0.45	-0.63	-.04	.37**	.07**	.28**	.32**	.54**	.51**	---							
9 Self-regulatory purpose	2.89	.89	-0.53	-0.58	-.08**	.33**	.04	.26**	.32**	.46**	.43**	.72**	---						
10 Approval-seeking purpose	2.88	.83	-0.5	-0.42	-.03	.29**	.06*	.21**	.24**	.45**	.46**	.71**	.66**	---					
11 Homework effort	2.95	.75	-0.73	0.07	-.21**	.39**	.15**	.16**	.24**	.42**	.33**	.47**	.42**	.4**	---				
12 Homework management	3.49	.72	-0.3	-0.1	-.16**	.36**	.1**	.31**	.34**	.47**	.41**	.57**	.56**	.5**	.53**	---			
13 Grade (5-6 = 0; 7-8 = 1)	.35	.48	0.64	-1.64	.05	-.15**	-.15**	-.13**	-.14**	-.1**	-.09**	-.14**	-.14**	-.13**	-.16**	-.15**	---		
14 Homework quality-C	3.99	.49	-0.63	0.22	-.06*	.34**	.15**	.17**	.21**	.46**	.36**	.33**	.28**	.31**	.25**	.25**	-.22**	---	
15 Autonomy support-C	3.41	.6	.01	-0.71	-.03	.29**	.12**	.16**	.16**	.36**	.46**	.32**	.26**	.31**	.20**	.26**	-.19**	.79**	---
16 Perceived teacher feedback	3.63	1.09	-0.62	-0.45	-.07**	.37**	.06*	.24**	.32**	.74**	.73**	.59**	.5**	.51**	.44**	.51**	-.11**	.4**	.41**

Note. C = Class. S = Skewness. K = Kurtosis.
*$p < .05$. **$p < .01$.

Table 2

Multilevel results for student perceptions of feedback quality

Model Predictor	Null Model		Model 1		Model 2	
	b	*SE*	*b*	*SE*	*b*	*SE*
Student level						
Gender (female =0; male = 1)			0	0.03	0.03	0.03
Prior mathematics knowledge			0.06**	0.02	0.03	0.02
Parent education			-0.01	0.02	-0.01	0.02
Homework expectancy			-0.01	0.02	-0.02	0.02
Homework value			0.06*	0.03	0.03	0.02
Homework quality			0.44***	0.03	0.38***	0.03
Autonomy support			0.43***	0.02	0.38***	0.02
Academic purpose					0.07**	0.03
Self-regulatory purpose					0.02	0.03
Approval-seeking purpose					0.03	0.02
Homework effort					0.06**	0.03
Homework management					0.06**	0.03
Class level						
Grade (5-6 =0; 7-8 = 1)			-0.02	0.04	0.01	0.04
Homework quality			0.39***	0.06	0.34***	0.06
Autonomy support			0.52***	0.16	0.46***	0.06
Residual (σ^2)	0.842 (0.032)		0.31 (0.012)		0.291 (0.011)	
Intercept (τ_{00})	0.159 (0.035)		0.004 (0.003)		0.003 (0.003)	
Explained variance						
Within classes			62.9%		65.4%	
Between classes			97.6%		97.5%	
Total			68.7%		70.5%	
Deviance statistics (parameters)	3910.74 (3)		2391.85 (13)		2305.65 (18)	

*$p < .05$. **$p < .01$. ***$p < .001$.

ment (0.12). Given the risk of Type 1 error even with the ICC1 as low as 0.01-0.02 (Nielsen et al., 2021), multilevel modeling was used in subsequent analyses.

Level 1 variance analysis showed significant heterogeneity in the null model ($\chi^2 = 102.24$, $df = 73$, $p = .014$), Model 1 ($\chi^2 = 125.562$, $df = 73$, $p < .001$), and Model 2 ($\chi^2 = 117.008$, $df = 73$, $p = .001$). However, Garson (2012) finds that such heterogeneity does not compromise fixed effects or standardized errors.

Table 2 shows that Model 1 included seven student-level and three class-level variables. A likelihood ratio test revealed Model 1 significantly improved fit over the null model [$\chi^2(10) = 1518.88$, $p < .001$], explaining 62.9% of student-level, 97.6% of class-level, and 68.7% of the total variance in perceived feedback quality.

Model 2 added five student-level variables –academic, self-regulatory, approval-seeking purposes, homework effort, and management– to examine their predictive effects. It significantly outperformed Model 1 [$\chi^2(5) = 86.2$, $p < .001$], accounting for an additional 1.8% of the total variance. Model 2 explained 65.4% of student-level variance, 97.5% class-level variance, and 70.5% of total variance in perceived feedback quality. At the student level, perceived feedback quality was positively linked to autonomy support, homework quality, academic purpose, homework effort, and management. At the class level, it was positively linked to autonomy support and homework quality.

Discussion

Grounded in theoretical frameworks and prior research, this research explored multilevel models of perceived feedback quality, with a novel focus on homework purposes, effort, and management –variables neglected in prior studies. The next section examines key predictors identified in prior studies, followed by a discussion of our results on the role of homework purposes, effort, and management.

Consistent findings, mixed evidence, and unresolved questions

Consistent with theoretical perspectives and prior findings on feedback (e.g., Mulder & Ellinger, 2013; Xu, 2024a), perceived feedback quality was positively linked to autonomy sup-

port and homework quality at both individual and class levels, but not to background characteristics like gender, prior knowledge, and parent education. Importantly, this pattern suggests that students' feedback experiences are affected by instructional conditions that teachers can influence rather than by relatively stable demographic factors. Taken together with Xu's (2024a) work in China, our results provide convergent evidence from two distinct educational settings that high-quality homework contexts and autonomy-supportive classroom climates are central correlates of perceived feedback quality; however, broader cross-cultural generalization should remain tentative until further research directly investigates measurement equivalence and tests whether these relationships vary across countries and school systems.

Our findings showed no relationship between perceived feedback quality and homework expectancy or value, diverging from Xu's (2024a) findings with Chinese students, who showed positive links. This contrast may reflect cultural differences in the meaning of homework and feedback. Turkish students who feel confident in completing homework may be less likely to perceive feedback as useful or informative, given that homework is often perceived as a routine or compliance-based task (Buyukalan & Altinay, 2018). In contrast, Chinese students generally place high importance on education and regard homework as central to academic success (Xu & Corno, 2022). Hence, confidence in homework completion may increase receptivity to feedback and the likelihood of perceiving it as high quality. This pattern may be particularly pronounced in mathematics, a discipline highly valued in Chinese culture and deeply intertwined with Chinese identity. On the other hand, the Turkish context may reflect a different mechanism –instrumental and exam-linked valuing of mathematics (Kitchen et al., 2019)– which could influence whether feedback is experienced as informative versus merely confirmatory of correctness.

The non-significant association between homework value and perceived feedback quality appears attributable to intermediary variables. Homework value predicted perceived feedback quality in Model 1, yet this effect disappeared in Model 2 after accounting for homework purpose, effort, and management, suggesting an indirect pathway through these processes. At the same time, this pattern raises open questions: do purpose, effort, and management fully mediate the value to feedback link, or do they partly proxy other unmeasured processes (e.g., students' help seeing)? Is the pathway stable across school levels (e.g., middle school or high school)?

Echoing our multilevel results and prior work (e.g., Xu, 2024a), class-level predictors –namely homework quality and autonomy support– showed strong relationships with perceived feedback quality, highlighting the importance of teachers' instructional practices in shaping students' feedback experiences. These findings underscore that effective feedback is not delivered in isolation but is embedded within supportive class environments that emphasize autonomy and well-designed homework tasks. Thus, perceived feedback quality seems to reflect both instructional context teachers create and the motivational and self-regulatory capacities students bring to homework.

Homework purposes, effort, and management

Informed by self-regulation and growth mindset theories (Dweck & Yeager, 2019; Winstone et al., 2017), this research provided empirical support to the hypotheses that perceived feedback quality was positively linked to homework effort and management. This suggests that homework effort and management may enhance perceived feedback quality, by promoting progress, self-discipline, resilience, and desirable study habits, and ultimately students' responsiveness to and engagement with feedback. Notably, these associations remain significant even after accounting for key variables from theoretical frameworks.

Our findings revealed that perceived feedback quality was positively linked to academic purpose, but not to approval-seeking or self-regulatory purposes. This may lie in how students view homework's role. When driven by academic purpose –seeing homework as a tool for learning– they are more inclined to value and engage with feedback, as it aligns with their goals and appears more relevant, informative, and useful. In contrast, when driven by approval-seeking or self-regulatory purposes, students may view feedback as less central to their learning. Those seeking approval may prioritize external expectations, whereas those driven by self-regulation may focus on efficiency and persistence –both potentially overlooking feedback as a tool for deeper understanding.

When academic purpose, homework effort, and management were removed from Model 2, self-regulatory purpose and approval-seeking purpose became significant predictors of perceived feedback quality. This pattern may suggest that their influence is, at least in part, channeled through academic purpose, and potentially homework effort and management.

One likely mechanism involves internalization accompanied by goal shift. Students who initially engage in homework for self-regulation or approval reasons (e.g., keeping themselves on track and pleasing parents or teachers) may gradually convert these motives into clearly defined academic aims (e.g., mastering content). As a result, academic purpose may become a more proximal lens through which homework feedback is perceived: when homework is pursued with learning goals in mind, teacher comments are more likely to be viewed as diagnostic cues about progress and misconceptions rather than a signal that the task is done.

Another plausible mechanism is engagement-mediated attention processing of feedback. Self-regulatory purpose may promote greater homework effort and management (e.g., planning and monitoring), thereby increasing students' opportunities to detect mismatches flagged by feedback and to link feedback to particular misconceptions. Approval-seeking purpose, while more externally driven, may likewise encourage regular completion and adherence to expectations – especially in middle-school contexts characterized by close teacher oversight and parental monitoring. Greater engagement thus expands students' exposure to feedback and increases the probability that students scrutinize and act on comments. As a result, students who put forth more effort and manage homework more frequently may be more inclined to perceive feedback as informative and useful.

Taken together, Model 2 explained 1.8% more variance in perceived feedback quality over Model 1. Though modest, this increment is notable given the inclusion of powerful predictors in the model (e.g., autonomy support and homework quality). Small effects can still have practical significance in education research (Trautwein et al., 2012) and the influence of homework purposes, effort, and management may build over time.

Limitations and future investigation

While this study contributes new insights regarding the role of homework purposes, effort, and management, several limitations should be noted. Apart from mathematics as an external validity indicator, data were based on self-reports, which may introduce social desirability biases (Xu, 2025). Whereas we included class-level homework quality and autonomy support, contextual variables such as course level (basic vs. advanced mathematics) and specific teacher feedback practices (e.g., written comments vs. grades only) were unavailable. Further investigation may benefit from teacher-reported or observational indicators of feedback characteristics and instructional context to better capture classroom-level variability on feedback perceptions.

The attenuation of the homework value effect after controlling for homework purpose, effort, and management should be viewed cautiously, as these theoretically related variables share variance. Future multilevel SEM studies may more directly test whether they function as pathways linking homework value to perceived feedback quality.

Although we modeled homework purpose, effort, and management as predictors, our cross-sectional design precludes causal inference. Perceived feedback quality may likewise influence students' effort and regulation. Accordingly, the findings are correlational, and longitudinal or multilevel SEM studies are needed to test bidirectional effects.

Future research could enhance these findings using experimental designs, trace data, and observational methods. As this investigation centered on mathematics homework in Turkish middle schools –and feedback perceptions can vary across academic subject, school level, and cultures– extending this work to other instructional domains and populations is warranted.

Practical implications

Because academic purpose appears central to students' perceptions of feedback quality – both directly and indirectly – greater attention may be warranted toward cultivating this purpose. One promising approach involves designing high-quality homework that helps students recognize its role in deepening understanding. This aligns with our finding that homework quality predicts perceived feedback quality at both the student and class levels. Clearly communicating learning goals and encouraging students to reflect on their understanding upon completion may further promote academic ownership. These recommendations align with, and expand, Corno's (2000) proposition that students who view homework as an opportunity to close learning gaps are more likely to derive meaning from daily work". When students engage in homework with a strong academic purpose, they may be more inclined to regard feedback as useful, informative, and of high quality.

The positive association between perceived feedback quality and homework effort underscores the importance of promoting homework effort as an integral part of the homework process. Fostering a growth mindset by emphasizing the importance of effort and viewing challenges as learning opportunities and recognizing students' initiatives and persistence –not only task completion– may help strengthen this process.

The positive link between homework management and perceived feedback quality suggests that students may benefit from actively self-regulating their homework. This involves planning, organizing workspace, managing time, and minimizing distractions, as well as sustaining motivation and regulating negative homework emotions when faced with academic challenges. Such self-regulatory practices may allow students to approach homework more strategically, engage more deeply with feedback, and develop more positive perceptions of its quality.

Conclusions

This multilevel study contributes to the literature by showing that perceived feedback quality was positively linked to academic purpose, homework effort, and management, even after controlling for other relevant constructs. The results also point to the nuanced nature of the homework process, tentatively suggesting that academic purpose may serve as a more proximal lens for interpreting feedback, whereas approval-seeking and self-regulatory purposes might shape feedback perceptions indirectly, via their associations with homework effort and management. Taken together, these results imply that strengthening students' academic purpose, effort, and management may be crucial for fostering constructive engagement with homework feedback. Practices such as designing purposeful homework, emphasizing effort, promoting self-regulatory capacities, and incorporating students' perspectives on effective feedback may help learners view feedback as more useful, informative, and high in quality.

Author contributions

Conceptualization: J.X., S.A., M.Ö.
Data curation: S.A., M.Ö.
Formal analysis: J.X.
Investigation: S.A., M.Ö.
Methodology: J.X., J.C.N.
Writing – original draft: J.X.
Writing – review & editing: J.C.N., J.X., S.A., M.Ö.

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Declaration of interests

The authors declare that there is no conflict of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding/first author.

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