Metacognition and Learning (2025) 20:27
https://doi.org/10.1007/s11409-025-09431-3

Teacher involvement and self-regulation in homework: impact on secondary school students' homework behavior

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Received: 27 May 2024 / Accepted: 14 June 2025

Abstract
This study aimed to examine the relationships between teachers' involvement in homework (homework quality), students' use of homework management strategies (self-regulation skills), and homework behaviour. Teacher involvement in homework included homework quality, amount of feedback, quality of feedback, and autonomy support. Homework management included arranging the environment, time management, monitoring motivation, controlling emotions, focusing attention, and self-regulation skills. Homework behaviour included homework completion and going to school without homework. The moderating effect of gender and grade on the interaction between the variables was also analysed in the study. The study was conducted on 525 secondary school students in grades 5–8. The study found that teacher efforts to improve the quality of homework had a strong interaction with students' use of homework management skills. Students who used homework management skills at a high level were more likely to complete their homework. The interaction between teacher homework involvement and homework behaviour was positive both directly and indirectly through the use of homework management skills. The interaction between the two variables was mostly mediated by homework management skills. Female students and students in grades 7 and 8 used homework management skills more effectively as a means of achieving success.

Keywords Homework quality · Teacher involvement · Self-regulation homework management · Homework behaviour

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Published online: 03 July 2025

Introduction

Despite the ongoing debate about the benefits of homework for students, it continues to play an important role in education around the world (Fan et al., 2017; Fernández-Alonso et al., 2019). Although homework is disliked by most students (Dettmers et al., 2011), parents and teachers generally agree on the necessity of homework. This suggests that in order to do homework more effective in the educational process, the necessary factors need to be identified and appropriate solutions continuously developed. Homework, especially in secondary school and beyond, takes place in a learning environment where students work largely on their own (Costa et al., 2016). This does homework a teaching practice that requires the active use of self-regulation skills. Self-regulation skills are acquired by students throughout the learning process and are used when needed (Xu, 2024a). If the student does not consider homework important, is not sufficiently motivated to do it, or does not consider it necessary, he/she may not use these skills when doing homework (Xu, 2023b; Xu & Wu, 2013a, b). The teacher's effort in preparing homework, the quality of the homework, and the frequency and quality of feedback influence students' homework behaviour (Avcı & Özgenel, 2025; Moroni et al., 2015; Patall et al., 2010). Teachers' efforts in this process are positively correlated with the value students place on homework. Similarly, the effort put into the feedback process positively influences students' homework behaviour (Xu & Corno, 2022). The relationship between teachers' attitudes and behaviours during the homework process, students' use of self-regulation skills and homework behaviour has received little attention. It is clear that studies that examine these three relationships in detail will make significant contributions to the homework literature. Furthermore, a detailed examination of these relationships will also allow the theoretical homework model described by Trautwein et al. (2006) to be tested.

Cross-cultural research shows that homework practices vary across cultural contexts, particularly between individualistic and collectivistic societies. For example, Ozyildirim's (2022) meta-analysis found that the link between homework time and achievement was stronger in collectivist cultures. Similarly, Kim and Fong (2014) observed more authoritarian involvement by Chinese parents compared to the supportive style of US parents. Given Turkey's moderately collectivist orientation (Collectivist Countries 2025), social expectations and family influence may play a stronger role in students' homework behaviours. Thus, cultural background may inform homework practices even when not directly examined in this study.

Research indicates that self-regulation skills develop at an earlier age in individualistic societies, as evidenced by studies of students (Haslam et al., 2019). However, the socioeconomic status of families, especially in low-income countries, has been shown to delay the development of these skills. Turkey is in an intermediate position in this respect, with children's self-regulation skills largely influenced by family and adult attitudes. In contrast, in countries with a strong collectivist tradition, such as China, the correlation between teachers' practices aimed at enhancing homework quality and students' self-regulation skills may be negligible due to the prevalence of teacher and parental control (McClelland & Wanless, 2015).In partially collectivist societies like Turkey, adult support emerges as a pivotal factor in students' effective utilization of self-regulation skills. Moreover, studies have indicated that students in individualistic societies tend to utilize self-regulation skills more frequently (Xu et al., 2023).

In Turkey, parents and teachers recognize the importance of homework for children's academic development, despite the lack of legal regulations (Kaplan Can & Gelbal, 2022). It remains a prevalent component of the educational process (Avcı & Özgenel, 2025). Teacher involvement in homework preparation and assessment is key to academic success (Dettmers et al., 2010). A cross-cultural study by Dettmers et al. (2009) found that, despite long homework periods in Turkey, it didn't improve academic achievement. There is a need for a detailed examination of the current situation in Turkey to identify effective solutions.

Related literature

Teacher homework involvement

Teacher homework involvement refers to the extent to which students perceive the teacher's practices in the processes of homework planning and feedback. While teachers' homework-related practices have been studied at the classroom level, students' perceptions of teachers' practices have been studied at the student level (Avcı & Özgenel, 2025). Teacher involvement in homework is realised in three main dimensions: design, feedback, and autonomy (Avcı et al., 2024; Núñez et al., 2015; Xu, 2016; Xu et al., 2022). The design dimension includes the processes of planning, preparing and assigning homework to students. These processes determine whether homework is designed in accordance with educational objectives and how it serves students' learning goals (Epstein & Van Voorhis, 2012; Núñez et al., 2015). The feedback dimension includes teachers' review, collection and provision of written or oral feedback on students' completed work. This dimension is assessed in terms of the frequency and quality of feedback, with the aim of measuring its impact on student achievement (Cunha et al., 2019). The autonomy dimension refers to the teacher's respect for students' choices in the preparation, selection and production of homework. This dimension has the potential to increase students' motivation and independent learning skills by giving them more control and responsibility over their homework (Xu, 2016; Yang & Xu, 2019).

Quality homework requires a balanced integration of a number of important factors to support achievement. Firstly, it is essential that homework is relevant to students' interests and needs. This will increase students' motivation and enable them to participate more actively in the learning process (Hagger et al., 2015; Xu & Corno, 2022). It is also necessary to clearly define the purpose of assignments so that expectations are clearly set for both teachers and students (Epstein & Van Voorhis, 2012). Homework is used to support academic development and is often preferred by teachers (Urauchi & Tanno, 2024). Such assignments are perceived by students to be of higher quality, especially when they are given to reinforce course topics (Rosário et al., 2018). Another important factor in improving the quality of homework is that the level of difficulty of the homework should be appropriate to the student's ability. For students with high ability, challenging homework can increase motivation and academic performance (Avcı, 2022; Dettmers et al., 2010). In contrast, for lower ability students, less demanding tasks should be set to enable them to achieve the learning objectives (Trautwein et al., 2002). The appropriateness of homework to the student increases homework effort and academic achievement (Trautwein et al., 2006; Zakharov et al., 2014). However, according to Margolis and McCabe (2004), assigning challenging homework to students with learning difficulties can cause them to develop negative attitudes towards

homework. Homework is more effective when it is organised according to students' characteristics, interests and needs, and students benefit more from homework that best suits their needs (Zakharov et al., 2014).

An important factor in the successful completion of homework is control. A study by Trautwein et al. (2009) found that students put more effort into their homework when they felt controlled by the teacher. It has been observed that checking and correcting homework in class increases the benefits of doing homework (Rosário et al., 2019b; Cunha et al., 2018). Rather than putting pressure on students, checking homework serves the function of showing that their efforts are recognised and valued (Trautwein et al., 2006).

Autonomy support involves giving students choices in the selection, preparation and presentation of assignments, valuing their decisions and encouraging them to express themselves. This approach is an effective way to increase students' motivation and thus their participation in the learning process (Feng et al., 2019; Hagger et al., 2015; Yang & Xu, 2019). Autonomy gives students more control and choice over course content and assignments, enabling them to be active participants in the educational process. This helps students to develop self-regulation skills and achieve their own learning goals. Studies by Avcı et al., 2025a); Zimmerman (2023); Rosário et al. (2009), 2018) have shown that autonomy is a motivating factor that enhances learning at all academic levels.

Homework management

Homework management refers to students' use of self-regulated learning strategies in the process of completing homework (Xu, 2024a). Self-regulation is the process by which individuals effectively manage their thoughts, feelings, behaviours and environment to achieve academic goals (Zimmerman, 2023). Homework is one of the learning activities where students most need to use self-regulation strategies, especially at the secondary school level (Zimmerman, 2023). Homework at primary school level is beneficial for the development of self-regulation skills, such as gaining a sense of responsibility, time management, developing study habits and persevering until the task is completed. However, due to the active involvement of parents in the process, students make very little use of self-regulation skills in primary school (Cooper et al., 2006; Muijs & Bokhove, 2020). With the transition to secondary school, communication between parents and teachers decreases and parental support decreases, requiring students to use more self-regulation skills (Núñez et al., 2019). During adolescence, as students' desire for emancipation increases, they demand less parental support, which can sometimes lead to conflict (Shah et al., 2023; Zheng & Chen, 2025). In addition, the difficulty of the subjects makes it difficult for parents to help directly (Jiang et al., 2023). According to Hong et al. (2009), self-regulation skills in secondary school strengthen the positive relationship between time spent on homework and academic achievement. However, students need to be highly motivated to use these skills effectively. The positive relationship between motivational factors and self-regulation encourages students to adopt these skills (Zheng et al., 2021; Xu & Wu, 2013a, b).

Volitional control, one of the models of self-regulation, provides the theoretical basis for explaining the use of self-regulatory strategies in homework. Volitional control is the ability of individuals to control their own behaviour, emotions, and thoughts (Corno, 2023). Volitional control is a structure that enables the individual to stay in the direction of the goal when the goal is set by another source (Corno, 2011). In homework, the teacher sets the

goals and the student uses strategies such as organising the environment, managing time, focusing attention, monitoring motivation and controlling emotions to achieve the goal (Xu, 2024a). The five self-regulation strategies used with students to complete homework are based on research by Xu and Corno (1998). In the following years, Xu continued to work on the topic and developed the Homework Management Scale (HMS) for middle and high school students (Xu et al., 2015; Xu, 2024b). Xu and Corno (2003) discussed homework management in five dimensions (Cunha et al., 2018): (1) environmental structuring, (2) time management, (3) distraction management, (4) motivation monitoring, and (5) emotion management. Organising the environment includes creating a distraction-free workspace, gathering necessary materials before starting work, and finding a quiet environment that is conducive to learning (Zimmerman, 2023). Time management has been defined as 'the effective use of time while performing specific goal-directed activities' (Claessens et al., 2007, p.262). Managing distractions involves avoiding distractions and maintaining focus while performing academic activities such as homework (Xu, 2013; Xu & Corno, 1998). Monitoring Motivation involves consciously monitoring students' motivation to start, maintain, and complete homework and developing ways to keep them motivated as needed (Xu, 2013). Controlling emotions involves students identifying, tracking and regulating the emotions they experience while doing homework (Xu, 2013).

The relationship between teacher involvement, homework management and homework behaviour

In order to actively use self-regulation skills, students must prefer to use these skills. At the middle school level, students often use the skills to succeed, whereas at the high school level, students prefer not to use the skills because they are less interested in doing homework. In order for students to prefer to use self-regulation strategies, they need to be motivated to do homework. The existence of a positive relationship between teacher involvement in homework and self-regulation strategies has been demonstrated in numerous studies. Within teacher homework involvement, homework feedback (Corno & Xu, 2004; Xu et al., 2017a, b; Xu, 2023b; Xu & Wu, 2013a, b), autonomy support (Xu, 2016, 2024a; Xu et al., 2017a, b), homework quality (Xu, 2023b), and the use of homework management skills were positively correlated. Similar results were found in studies based on individual strategies. Xu (2024) found a positive relationship between time management and teacher feedback and autonomy support.

Support for autonomy has an important place in the relationship with task management skills. When teachers leave students free to make their own choices, rather than putting pressure on them and making choices for them, students are more likely to use self-regulation skills (Xu, 2016, 2024a; Xu et al., 2017a, b). In primary school, students develop self-regulation skills but do not need to use them due to the frequency of family and teacher control (Cooper et al., 2006; Corno & Xu, 2004). Therefore, external control may inhibit the use of self-regulation or task management strategies. Autonomy support is also strongly positively related to learning outcomes. Students' perceived teacher autonomy support is positively related to homework effort, homework completion, and academic achievement (Hagger et al., 2015; Trautwein et al., 2009; Xu, 2016; Yang & Xu, 2019). In Kramer and Kusurkar's (2017) study, university students' intrinsic motivation and interest in the course increased as a result of creating biology blogs according to their own preferences without guidance.

Teachers' homework involvement practices are generally positively related to academic outcomes. It can be said that all efforts based on improving the quality of learning are reciprocated by an increase in homework completion and course grades. In this context, homework quality and homework behaviour have been investigated in many studies (Núñez et al., 2015; Patall et al., 2010; Rosário et al., 2018; Suárez et al., 2019; Xu, 202a4; Yang & Xu, 2019) and academic success (Avcı & Özgenel, 2025; Fernández-Alonso et al., 2019; Flunger et al., 2017; Trautwein & Lüdtke, 2009; Yang & Xu, 2019) show a positive relationship between feedback quality and homework behaviour. Feedback quality homework behaviour (Hagger et al., 2015; Rosário et al., 2015; Trautwein et al., 2009; Trautwein & Lüdtke, 2009; Xu, 2024a) and academic success (Dettmers et al., 2010; Moroni et al., 2015; Patall et al., 2010). Another factor that is positively related to homework success is teacher involvement. All types of feedback from teachers on homework increase homework success (Rosário et al., 2015). Students make more effort when they know that their teachers will check their homework (Trautwein et al., 2009). In a study conducted by Núñez et al. (2015), positive feedback from teachers was found to promote positive homework-related behaviours among students, thereby increasing academic achievement.

Gender and grade

In this study, theoretical foundations and empirical findings have guided the examination of the influence of gender and age on the relationship between teacher involvement in homework, self-regulation, and homework behaviors. On a theoretical level, girls generally exhibit significantly stronger self-regulation skills than boys (Alghamdi et al., 2020; Zimmerman, 2023). Similarly, girls exhibit better homework management skills than boys (Xu, 2022; Xu & Corno, 2006). According to Aeon et al. (2021), girls have better time management skills. Compared to boys, girls have been shown to work more frequently to manage their workspace, monitor motivation, and control negative emotions (Xu, 2010a, b). In contrast, Hong et al. (2009) found that there was no significant gender difference in homework self-regulation. Empirical findings indicate that girls spend more time on academic activities and achieve higher grades (Aeon et al., 2021). Accordingly, female students spend more time on homework than male students (Gershenson & Holt, 2015). Girls tend to put more effort into their homework than boys (Avcı et al., 2025a; Cooper et al., 2006; Pendergast et al., 2018). Girls are also more likely to complete their homework (Patall et al., 2008; Xu, 2010a, b). These gender differences justify investigating gender as a moderating factor in the relationship between teacher involvement, self-regulation, and homework behaviors. Research suggests that girls' stronger self-regulation skills and academic engagement may lead them to benefit differently from teacher involvement compared to boys (Duckworth & Seligman, 2006; Xu, 2010a, b). Understanding these variations can help develop more effective, gender-sensitive educational strategies.

According to psychological findings on development, students' academic motivation and self-regulation skills change with age (Bardach et al., 2023; Katsantonis, 2024). In the early years of primary education, students are more open to learning through homework. However, as they grow older, the perceived value of homework declines, motivation decreases, and homework processes become less systematic (Epstein & Van Voorhis, 2012; Ozyildirim, 2022). Their attitudes toward homework become increasingly negative (Avcı et al., 2025a), and they enjoy it less (Camacho-Morles et al., 2009). While younger

students often view homework as a learning aid (Patall et al., 2008), older students tend to find it boring, less engaging, and meaningless (Avcı et al., 2025a; Patall et al., 2008). In the context of self-regulation, studies on secondary and high school students have shown that homework management skills do not significantly differ by grade level (Xu, 2006). These developmental changes highlight the importance of examining how teacher involvement in homework interacts with students' self-regulation skills and homework behaviors across different grade levels. Understanding whether teacher support can mitigate declines in motivation and homework engagement among older students is crucial for developing effective educational strategies.

In light of the theoretical foundations and empirical findings discussed above, there is a clear need for a comprehensive examination of the relationships among teacher involvement in homework, students' self-regulation strategies, and homework behavior. While previous research has established links between these constructs, the interplay between them-specifically, how teacher involvement influences students' use of self-regulation strategies and, in turn, their homework behavior-has not been sufficiently explored. Furthermore, it remains unclear whether these relationships vary according to students' gender and grade level. Therefore, the present study aims to examine the relationship between teachers' homework involvement (specifically, homework quality), students' use of homework management strategies (as an indicator of self-regulation), and their homework behavior. In addition, this study examines the mediating role of homework management strategies in the relationship between teacher involvement and homework behavior. The potential moderating roles of gender and grade level will also be examined to determine whether teacher support functions differently across student subgroups. Findings from this research are expected to contribute both to the theoretical understanding of homework processes and to the development of more targeted and effective educational practices.

The present study

This study was motivated by the aim of determining the relationships between teachers' involvement in homework (homework quality), students' use of homework management strategies (self-regulation skills), and homework behaviours. The research model was designed according to the theoretical models described in the homework literature (Avcı & Özgenel, 2025; Trautwein et al., 2006; Xu & Corno, 2022). Teacher homework involvement is a combination of homework quality, feedback quality, feedback quantity and autonomy support. The homework method consists of five dimensions defined by Xu (2010a, b): (1) organising the environment; (2) managing time; (3) focusing attention; (4) monitoring motivation; and (5) controlling emotions. Homework behaviour included the amount of homework completed per week and going to school with homework completed. The relationships between the variables were tested using the theoretical model. Teacher homework involvement, homework management and homework behaviour were defined as latent variables in the model. The measurement tools used in this study must be applied through a course that is subject specific. In this study, the mathematics course was preferred because homework is given more frequently, it is perceived as more important and the relationships between the variables can be seen more clearly (Bempechat, 2019; Clara, 2021; Cooper, 2015).

In line with the aims of the study, four research questions were identified: (1) Is there a relationship between teachers' involvement in homework and students' use of homework

management strategies? (2) Is there a mediating role of homework management in the relationship between teachers' homework involvement and students' homework behaviour? (3) Is there a relationship between the use of homework management strategies and homework behaviour? (4) Does the relationship between teachers' involvement in homework, students' homework management strategies and homework behaviours differ according to students' gender and grade? Hypotheses of the study:

H1: The homework literature suggests that teacher involvement in homework is related to students' use of homework management strategies. In particular, the quality and quantity of teacher feedback on homework is positively related to the use of homework management strategies (Corno & Xu, 2004; Xu et al., 2017a, b; Xu, 2023b; Xu & Wu, 2013a, b). In addition, teacher autonomy support also has a positive effect on the use of homework management strategies (Xu, 2016, 2024a; Xu et al., 2017a, b). Based on these findings, it was hypothesised that there is a positive relationship between teacher involvement in homework (homework quality, feedback quality, feedback quantity, and autonomy support) and students' use of homework management strategies (arranging the environment, managing time, focusing attention, monitoring motivation, and controlling emotions).

H2 a: Research shows that positive teacher behaviour in homework preparation and assessment increases the likelihood of students completing their homework (Núñez et al., 2015; Patall et al., 2010; Rosário et al., 2018; Suárez et al., 2019; Xu, 2024a; Yang & Xu, 2019). Based on the results of the studies in the literature, it was hypothesised that there is a positive relationship between teacher homework involvement and homework behaviour.

H2b: Active use of self-regulation skills in general, and homework management skills in particular, positively enhances students' academic outcomes. Research findings in the literature support that there is a positive relationship between teacher homework involvement and homework behaviour (Corno & Xu, 2004; Xu et al., 2017a, b; Xu, 2016, 2023b, c, 2024a; Xu & Wu, 2013a, b). In line with the literature, it was hypothesised that there would be a positive relationship between self-regulation skills and homework behaviour in this study.

H3: Trautwein et al. (2006) show that homework management skills have a mediating role between teacher homework behaviour and homework behaviour in the homework model. The results of the research on the pairwise relationships between the three variables show that there is a positive relationship (Trautwein et al., 2006). Therefore, it is hypothesised that homework management skills have a mediating role in the relationship between teacher homework involvement and homework behaviour.

H4: It is hypothesised that the relationship between teacher involvement in homework, students' use of homework management strategies and homework behaviour will differ by gender and grade. One of the main reasons for this hypothesis is that female students use self-regulation skills more than male students (Alghamdi et al., 2020; Xu, 2022; Xu & Corno, 2006). In terms of grade level, the use of self-regulation skills decreases with increasing age (Bardach et al., 2023; Katsantonis, 2024). In the study, it was assumed that this differentiation would be related to the mediating role of homework management.

Method

Participants

This study was conducted with a sample of 632 secondary school students from a metropolitan city in Turkey. An initial examination of the raw data led to the removal of 107 responses due to excessive missing values, with each exceeding 5% missingness. Additionally, 12 more cases with less than 5% missing data were identified. Given that the missing data remained within an acceptable threshold for those cases, multiple imputation was considered an appropriate method for handling the missing values. However, before proceeding with imputation, Little's MCAR test was conducted to determine whether the missing data followed a random pattern. The results were not statistically significant, $\chi^2(10) = 11.49$, $p = .320$, suggesting that the missing values were not systematically related to the observed variables and were unlikely to introduce systematic bias. Further comparisons of arithmetic means and frequency distributions between the full dataset and excluded cases revealed no significant differences in key study variables. This finding further supported the assumption that the missing data did not alter the distributional and correlational properties of the dataset. Based on these results, multiple imputation was performed using the MICE package (van Buuren & Groothuis-Oudshoorn, 2011) in R. As a result, the final study group consisted of 525 students whose data were retained for analysis.

In the Turkish education system, secondary school encompasses grades 4 through 8, and students from all these grade levels participated in the study. Research data was collected from 8 different schools and 26 classes. The final sample consisted of 257 girls (49%) and 268 boys (51%), with participants' ages ranging from 10 to 15 years (M = 11.99, SD = 1.34). The distribution of students across grade levels was as follows: eighth grade students constituted the largest group (29.3%), followed by those in fifth grade (27.2%), sixth grade (23.8%), and seventh grade (19.6%).

Measurements

The instruments used in this study were adapted into Turkish by Avcı and Özgenel (2024), and the Turkish versions of the forms were utilized for data collection.

Teacher homework involvement

The Teacher Homework Involvement Scale (THIS), developed by Xu (2016) and adapted into Turkish by Avcı and Özgenel (2024), was used to determine homework quality. The scale consists of three sub-dimensions named as homework quality (e.g. "Our math homework assignments really help us to understand our math lessons"), feedback quality (e.g. "The performance feedback I receive from my math teacher is helpful"), autonomy support (e.g. "My math teacher listens to my ideas about homework assignments"), 4 items in each sub-dimension and 12 items in total. The response scale of the scale is 4-point Likert type (1 = strongly disagree to 4 = strongly agree). The Cronbach's alpha values of the Turkish form are 0.866, 0.848, and 0.863 for the dimensions of homework quality, feedback quality, and autonomy support, respectively. For the present study, a confirmatory factor analysis (CFA) was conducted to ensure the construct validity of the scale examining

its three sub dimensions: Homework quality, autonomy support and feedback quality. The findings confirmed the expected structure, with fit indices indicating an acceptable model fit (CMIN = 2.91; CFI = 0.92; TLI = 0.91; GFI = 0.91; RMSEA = 0.06; SRMR = 0.05). As to the reliability, Mc Donalds Omega was calculated considering the multidimensional nature of the scale. The results showed that the total scale showed strong reliability (ΩT = 0.92, ΩH = 0.70). The subscale reliability estimates were supported the reliability of the scale: homework quality (ΩT = 0.87, ΩH = 0.55), autonomy support (ΩT = 0.84, ΩH = 0.64) and feedback quality (ΩT = 0.71, ΩH = 0.10).

The Teacher Feedback Frequency Scale (TFFS) (Xu, 2011) was used to determine teachers' feedback frequency. Adapted into Turkish by Avcı and Özgenel (2024), the scale consists of five items (e.g. "How much of your assigned homework is discussed in class?") and has a unidimensional structure. The response scale ranges from 1 (none) to 5 (all). Reliability analysis indicated that the Cronbach's alpha coefficient was 0.701, and McDonald's Omega for the total scale was ΩT = 0.77, ΩH = 0.53. The THIS and the TFFS have been frequently used in the homework literature to assess students' perceptions of teachers' homework practices (Avcı et al., 2025a; Xu & Corno, 2022).

Homework management

The Homework Management Scale (HMS) developed by Xu (2008a, 2008b) and adapted into Turkish by Avcı and Özgenel (2024) was used to measure homework management skills. The scale is Likert-type and consists of 22 items. The answers to the scale items are given on a scale expressed as (1) never, (2) rarely, (3) occasionally, (4) mostly, (5) always. There are five sub-dimensions in the scale: (a) organising the work environment (5 items, e.g. "Find a quiet area."), (b) time management (4 items, e.g. "Set priority and plan ahead."), (c) dealing with distractions (5 items, e.g. "Daydream during a mathematics Homework session "), (d) monitoring motivation (4 items, e.g. "Praise myself for good effort.") and (e) emotional control (4 items e.g. "Tell myself not to be bothered with previous mistakes."). Cronbach's alpha values for the subscales: 0.757 for organising the work environment, 0.786 for time management, 0.801 for dealing with distractions, 0.861 for motivation monitoring and 0.768 for emotional control. For the present study, CFA was repeated to ensure the construct validity of HMS. The results confirmed the hypothesized five dimension structure, with fit indices indicating an acceptable model fit (CMIN = 2.91; CFI = 0.92; TLI = 0.91; GFI = 0.91; RMSEA = 0.06; SRMR = 0.05). In addition, The McDonald's Omega (Ω) reliability analysis provided strong evidence for the internal consistency of HMS. The total scale demonstrated excellent reliability (ΩT = 0.92, ΩH = 0.75). The subscale reliability estimates were also calculated and estimated as follows: Environment (ΩT = 0.73, ΩH = 0.41), Time (ΩT = 0.80, ΩH = 0.59), Motivation (ΩT = 0.80, ΩH = 0.60), Emotion (ΩT = 0.40, ΩH = 0.02), and Distraction (ΩT = 0.83, ΩH = 0.56). The HMS has been frequently used in homework research to assess students' self-regulation skills in the context of homework (Avcı & Akıncı, 2025; Avcı et al., 2025b; Xu, 2023b).

Homework completion

The Homework Completion Scale assesses students' homework completion behaviour. A two-item scale is used to determine the level of homework completion as reported in the

literature (Xu, 2011; Xu & Wu, 2013a, b). The items are: (1) ‘’How much of your assigned homework do you usually complete?‘’ and (2) ‘’How often do you come to class without your homework?‘’ The response scale for the first item ranges from 1 (none) to 5 (all), while for the second item it ranges from 1 (never) to 5 (routinely). The Cronbach’s alpha internal reliability coefficient for the original scale is reported to be 0.71 (Xu, 2011). The scale has been adapted into Turkish by the researchers.

Statistical analysis

All statistical analyses were conducted using R (R Core Team, 2023). The primary goal of the analysis was to examine whether homework management played a mediating role in the relationship between teacher homework involvement and homework behavior. Before estimating the mediation model, several preliminary analyses were conducted to ensure that key statistical assumptions were met. The distributions of study variables were assessed using skewness and kurtosis values,, the linearity assumption was examined through scatterplots, the multicollinearity was assessed using variance inflation factor (VIF) values, and Breusch-Pagan tests were performed to check for homoscedasticity. Within the scope of the current study, confirmatory factor analysis (CFA) was conducted to provide additional evidence for the construct validity of the scales. The robust maximum likelihood estimation (MLR) method was employed in these analyses. As noted by Rhemtulla et al. (2012), when sample size is sufficient, items with four response categories can be treated as continuous variables, making the use of MLR an appropriate estimation method.

To test the mediation hypothesis, a stepwise approach was followed to establish the necessary conditions for mediation before estimating the full model. First, a direct effect model was tested to examine whether teacher homework involvement significantly predicted homework behavior when the mediator was not included. Next, the association between teacher homework involvement and homework management was analyzed, followed by an examination of the relationship between homework management and homework behavior. Once these conditions were confirmed, the full mediation model was estimated, incorporating both the direct and indirect pathways. Model fit was evaluated using multiple goodness-of-fit indices, including the comparative fit index (CFI), the goodness of fit index (GFI) and Tucker-Lewis index (TLI), where values above 0.90 indicated an acceptable fit and values above 0.95 suggested a strong model fit. The root mean square error of approximation (RMSEA) and the standardized root mean square residual (SRMR) was also examined, with values below 0.08 considered acceptable and values below 0.05 reflecting an excellent fit. The significance of the indirect effect was assessed using bootstrapping with 5,000 resamples, and 95% confidence intervals (CI) were computed. If the confidence interval did not include zero, the mediation effect was considered statistically significant (Preacher & Hayes, 2008). Finally, multi-group analyses were conducted to explore whether the mediation model varied across gender and grade levels. A series of chi-square difference tests were performed to determine whether the hypothesized model is valid across groups. All analyses were conducted using *lavaan* (Rosseel, 2012) for SEM estimation, while assumption testing and descriptive statistics were performed using base R functions.

Procedure

Before starting the data collection process, formal permission for the implementation was first obtained from the Ministry of National Education, then from school administrators and teachers. In the schools to be surveyed, written consent was first obtained from parents. Questionnaires were administered to students whose parents had given permission and who volunteered to participate during class time with the guidance of their teachers and the authors.

Findings

Preliminary analysis

Before conducting the mediation analysis, several assumptions were tested to ensure the validity of the model and descriptive statistics were calculated. First, normality was assessed using Kurtosis and Skewness vlues, confirming that the data exhibited acceptable levels of normality. Linearity was evaluated through scatterplots, demonstrating a clear linear relationship among homework quality, homework management, and homework behaviour. Multicollinearity diagnostics (VIF values) indicated no significant redundancy among predictor variables. Additionally, Breusch-Pagan tests confirmed homoscedasticity, ensuring that residual variances were evenly distributed. Given that all key assumptions were met, the mediation analysis was conducted.

Table 1 presents the descriptive statistics of the variables in the study and the correlations between the variables. The results of Pearson's correlation analysis (Table 1) showed significant correlations between teacher homework involvement/homework quality, homework management and homework behaviour. The dimensions of teacher homework involvement/homework quality, homework quality, feedback quality, feedback quantity and autonomy support were positively correlated at low and moderate levels (range of rs from 0.23 to 0.69). The four dimensions of homework quality were positively related to the environment, time, motivation and emotion dimensions of homework management at low and moderate levels (range of alpha values ranged from 0.17 to 0.47). Only the distraction dimension was not related to homework quality. Homework completion was positively related to all dimensions of homework quality and homework management. There is a positive relationship between homework completion and not going to school without homework (r=.47).

Path analysis

Before conducting the main analysis, we assessed whether a multilevel approach was warranted for the data. To evaluate this, an ICC analysis was performed for homework management (the mediating variable) and homework behaviour (the dependent variable). The results revealed that only 3.1% of the variance in homework management and 1.7% of the variance in homework behaviour could be attributed to differences between classrooms, with the vast majority of variance occurring at the individual level. Since ICC values below 0.05 indicate negligible clustering effects (Hox et al., 2017), applying a single-level modelling approach was considered statistically justified.

Table 1 Demographical characteristics of the participants and the pearson correlations among the variables

		1	2	3	4	5	6	7	8	9	10	11
1	HW Quality											
2	Feedback Quality	0.66**										
3	Autonomy Support	0.56**	0.69**									
4	Feedback Quantity	0.24**	0.29**	0.27**								
5	Environment	0.45**	0.45**	0.39**	0.17**							
6	Time	0.39**	0.47**	0.45**	0.21**	0.64**						
7	Motivation	0.39**	0.47**	0.46**	0.23**	0.55**	0.65**					
8	Emotion	0.31**	0.37**	0.39**	0.18**	0.51**	0.60**	0.72**				
9	Distraction	-0.03	-0.07	0.00	0.09	−0.11*	-0.01	0.11*	0.16**			
10	HW Complete	0.34**	0.35**	0.29**	0.10*	0.40**	0.39**	0.34**	0.30**	0.14**		
11	Without HW	0.31**	0.31**	0.24**	0.05	0.35**	0.32**	0.29**	0.26**	0.13**	0.47**	
	Mean	9.40	17.32	15.70	14.19	15.79	19.88	14.89	14.09	11.37	4.08	4.89
	SD	3.19	3.10	4.06	4.89	4.79	4.44	4.11	4.58	4.82	1.13	1.03
	Skewness	0.10	-1.49	-1.00	-0.57	-0.22	-0.92	-0.74	-0.49	0.31	-1.11	−0.902
	Kurtosis	-0.83	2.10	0.40	-0.72	-0.59	0.33	-0.14	-0.71	-0.91	0.64	0.107

Note. M: Mean, SD: Standard deviation, HW: Homework, * $p<.05$. ** $p<.01$

In addition, to ensure a rigorous examination of the hypothesized mediation model, a stepwise approach was employed. First, a direct effect model was tested to establish whether teacher homework involvement significantly predicted homework behaviour in the absence of the mediator. The results confirmed a significant direct relationship ($\chi^2(8)=9.81$, $p=.279$; CFI = 0.998; RMSEA = 0.021; SRMR = 0.023). Next, the association between teacher homework involvement and the mediator, homework management, was examined, revealing a significant predictive relationship ($\chi^2(26)=127.56$, $p<.001$; CFI = 0.948; RMSEA = 0.086; SRMR = 0.048). Finally, the effect of homework management on homework behavior was tested, showing a significant pathway ($\chi^2(13)=113.59$, $p<.001$; CFI = 0.923; RMSEA = 0.121; SRMR = 0.064). These findings establish that each component of the mediation model is supported, giving credence to the subsequent analysis of the full mediation model.

The path analysis conducted to examine the relationships among homework quality, homework management skills, and homework behaviour as outlined in Fig. 1. The model exhibited a significant improvement over the baseline model, $\chi^2(41)=162.89$, $p<.001$, confirming that the hypothesized relationships meaningfully explain the variance in homework behaviour. Model fit indices suggest an adequate fit to the data: CFI = 0.946 (> 0.90), TLI = 0.927 (> 0.90), RMSEA = 0.075 (90% CI [0.063, 0.088]), and SRMR = 0.051 (< 0.08). Although the RMSEA's upper CI value is slightly above the commonly accepted threshold of 0.08, its confidence interval includes values within the acceptable range, and the p value for RMSEA < 0.05 was significant ($p<.001$), suggesting moderate fit. Overall, these results imply that homework quality exerts both direct and indirect effects on homework behaviour through homework management skills (Table 2).

The results of the SEM analysis provided strong support for the hypothesized relationships between latent variables. The mediation analysis confirmed that teacher homework involvement significantly predicted homework management ($\beta=0.66$, $p<.01$), and homework management was a significant predictor of homework behavior ($\beta=0.43$, $p<.01$). The direct effect of teacher homework involvement on homework behavior remained statistically significant ($\beta=0.27$, $p<.01$), suggesting partial mediation. The indirect effect via homework management was also significant ($\beta=0.28$, $p<.01$, 95% CI [0.16, 0.40]), supporting the hypothesized mediation pathway. Finally, the total effect of teacher homework involvement on homework behavior was $\beta=0.54$, $p<.01$, indicating that both direct and indirect pathways contribute meaningfully to predicting homework behavior. These findings suggest that homework quality influences homework behavior both directly and indirectly through its impact on homework management.

Multi-group comparison

Gender

A multigroup SEM analysis was conducted to examine whether our hypothesized model was comparable across gender groups. To assess gender-based differences in the structural model, we conducted a multi-group path analysis using maximum likelihood estimation. Two groups were defined based on gender ($n_{female}=257$, $n_{male}=268$). The chi-square test for the constrained model was significant, $\chi^2(71)=154.60$, $p<.001$, suggesting some differences in path estimates across gender. However, given that the model involves only latent variables, traditional measurement invariance levels such as configural, metric, scalar, and strict

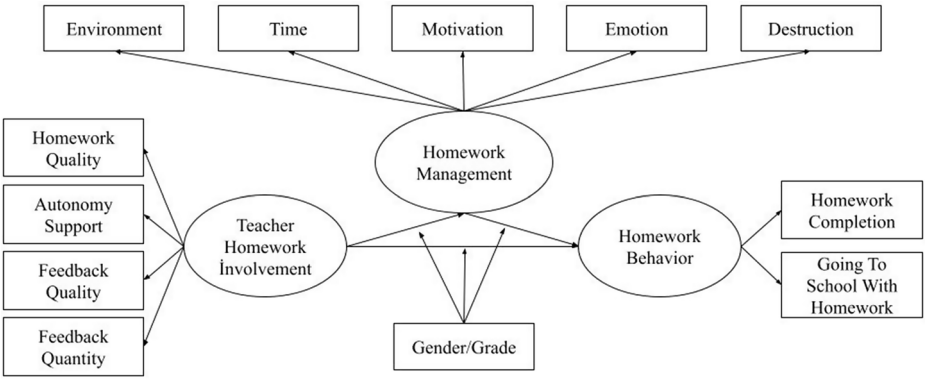

Fig. 1 Theoretical model

Table 2 Mediating effect of homework management in the relationship between homework quality and homework behaviours

Path	Estimate (SE)	z-value	95% CI
THI → HW quality	0.74 (0.03)	25.48**	[0.69 — 0.80]
THI → Feedback quality	0.88 (0.02)	42.69**	[0.84 — 0.92]
THI → Autonomy support	0.782 (0.02)	35.01**	[0.74 — 0.83]
THI → Feedback quantity	0.33 (0.05)	6.82**	[0.23 — 0.42]
HW management → Environment	0.72 (0.03)	24.59**	[0.66 — 0.78]
HW management → Time	0.81 (0.02)	32.87**	[0.76 — 0.85]
HW management → Motivation	0.83(0.02)	36.57**	[0.79 — 0.88]
HW management → Emotion	0.77 (0.03)	25.65**	[0.71 — 0.83]
HW management → Distraction	0.04 (0.06)	0.623	[-0.08 — 0.15]
HW behaviour → HW completion	0.74 (0.06)	13.35**	[0.63 — 0.85]
HW behaviour → Going school with HW	-0.63 (0.06)	-10.84	[-0.74 — -0.52]
THI → HW management (a)	0.66 (0.05)	13.97**	[0.56 — 0.75]
HW management → HW behaviour (b)	0.43 (0.09)	4.68**	[0.248 — 0.60]
THI → HW behaviour (c)	0.27 (0.09)	2.85**	[0.08 — 0.45]
Indirect Effect → a × b	0.28 (0.06)	4.57**	[0.16 — 0.40]
Total Effect → c + (a × b)	0.54 (0.06)	8.91**	[0.42 — 0.66]

Note: THI: Teacher homework involvement; HW: Homework

do not apply (Kline, 2016). Instead, our analysis directly assesses structural invariance, which is the appropriate procedure in path models without latent variables. The separate chi-square values for each group ($\chi^{2\ \text{female}} = 77.86$, $\chi^{2\ \text{male}} = 76.74$) indicate comparable fit, and any observed differences in structural parameters are likely to be substantive rather than measurement-related. Addirional chi square test also support that the model is comparable across the gender based groups ($p > .05$).

Further, to explore whether the connections among teacher homework involvement, homework management, and homework behavior differ between female and male students, we conducted a chi-square difference test (see Table 3). The results show that homework quality and homework management are similarly related for both girls ($\beta = 0.68$, $p < .01$) and boys ($\beta = 0.63$, $p < .01$), with no significant difference between the groups ($\Delta\chi^2 = 1.20$,

Table 3 Comparison of regression coefficients between gender groups

	Girl		Boy				
Parameter	Est	95% CI	Est	95% CI	$\Delta\chi^2$	CMIN	*p*
HW Management ← THI	0.68	[0.56–0.75]	0.63	[0.54–0.69]	1.20	1.20	0.273
HW Behaviour ← THI	0.06	[-0.02–0.08]	0.40	[0.16–0.45]	0.74	0.74	0.390
HW Behaviour ← HW Management	0.56	[0.35–0.60]	0.34	[0.10–0.50]	11.52	11.53	<0.01**
Indirect Effect(THI→HW Behaviour)	0.42	[0.39–0.46]	0.39	[0.10–0.50]			

Note: THI: Teacher homework involvement; HW: Homework

p=.273). This suggests that students' perceptions of teacher homework involvement influence their ability to manage homework in similar ways, regardless of gender. However, gender differences observed in the relationship between homework quality and homework behavior. For girls, this connection was not significant (β=0.06, p>.05), whereas for boys, teacher homework involvement had a meaningful impact on homework behavior (β=0.40, p<.01). Despite this contrast, the chi-square test did not reveal a statistically significant difference between groups ($\Delta\chi^2$ = 0.74, p=.390), indicating that while boys show a stronger direct effect of homework quality on behavior, this difference is not statistically robust. On the other hand, the influence of homework management on homework behavior was notably stronger for girls (β=0.56, p<.01) than for boys (β=0.34, p<.05). The chi-square difference test confirmed that this gender-based difference was statistically significant ($\Delta\chi^2$ = 11.52, p=.01). This suggests that girls tend to rely more on effective homework management strategies to maintain productive homework behaviors. Additionally, the indirect effect of teacher homework involvement on homework behavior through homework management was present in both genders, though slightly stronger for girls (β=0.42, p<.01) than for boys (β=0.39, p<.01).

Grade

A multigroup SEM analysis was conducted to examine whether the relationships among homework quality, homework management, and homework behaviours were equivalent across grade based groups (5-6th grades vs. 7-8th groups). To investigate whether the structural relations among observed variables differed across grade levels, we conducted a multigroup path analysis using maximum likelihood estimation. The model included two groups based on students' grade level (Group 1: n=268; Group 2: n=257), with 35 regression paths constrained to equality across groups. The overall model demonstrated a significant chi-square value, $\chi^2(71)=136.51$, p<.001, suggesting some potential misfit due to the imposed equality constraints. However, the separate model fit for each group (χ^2 = 62.66 for 5-6th groups; χ^2 = 73.85 for 7-8th grades) indicated reasonable fit within both groups. A further chi-square test revealed that the model fit better for the 7-8th grade group (p<.05).

In addition, to investigate whether the relationships between homework quality, homework management, and homework behavior differ across grade levels, a chi-square difference test was conducted (see Table 4). The findings indicate that the link between homework quality and homework management remains largely stable among both 5th −6th grade students (β=0.66, p<.01) and 7th–8th grade students (β=0.65, p<.01), with no significant difference between the groups ($\Delta\chi^2$ = 1.15, p=.278). This suggests that students, regardless of grade level, perceive the impact of homework quality on their ability to manage home-

Table 4 Comparison of regression coefficients between grade groups

	5th -6th grades		7th– 8th grades				
Parameter	Est	95% CI	Est	95% CI	$\Delta\chi^2$	CMIN	*p*
HW Management ← THI	0.66	[0.72–1.10]	0.65	[0.72–1.10]	1.15	1.15	0.278
HW Behavior ← THI	0.24	[0.03–0.15]	0.28	[0.03–0.15]	0.68	0.68	0.402
HW Behavior ← HW Management	0.35	[0.05–0.14]	0.42	[0.05–0.14]	10.32	10.35	0.01**
Indirect Effect (THI → HW Behavior)	0.40	[0.05–0.14]	0.38	[0.05–0.14]			

Note. M: Mean, SD: Standard deviation, HW: Homework, * $p<.05$. ** $p<.01$

work in similar ways. However, notable differences were observed in the direct relationship between homework quality and homework behavior. Among 5th −6th graders, this relationship was weak and not statistically significant ($\beta=0.24$, $p>.05$), whereas among 7th −8th graders, homework quality demonstrated a slightly stronger but still non-significant impact on homework behavior ($\beta=0.28$, $p>.05$). The chi-square test further indicated that this difference between grade groups was not statistically significant ($\Delta\chi^2 = 0.68$, $p=.402$), implying that while older students exhibit a stronger direct association, the difference lacks statistical robustness.

In contrast, the effect of homework management on homework behavior was significantly stronger among 7th −8th graders ($\beta=0.42$, $p<.05$) compared to their younger students ($\beta=0.35$, $p<.01$). The chi-square difference test confirmed that this variation between grade levels was statistically significant ($\Delta\chi^2 = 10.32$, $p=.01$). This suggests that as students advance in grade level, they become increasingly dependent on effective homework management strategies to support their engagement in homework-related tasks. Moreover, the indirect effect of homework quality on homework behavior through homework management was evident in both grade groups, though slightly stronger for younger students ($\beta=0.40$, $p<.01$) than for older students ($\beta=0.38$, $p<.01$).

Discussion

The results of this study draw attention to the relationship between teachers' involvement in homework and students' homework management and homework behaviour. Teacher involvement in homework includes homework quality, amount of feedback, quality of feedback and autonomy support. Homework management includes arranging the environment, time management, monitoring motivation, controlling emotions, focusing attention. Homework behaviour includes homework completion and going to school without homework. The theoretical model tested revealed the mediating role of homework management in the relationship between teacher involvement and homework behaviour. In addition, gender and grade level were included as moderating variables in the study.

Teacher homework involvement and homework management

The results of the study support the hypothesis that there is a positive relationship between teacher involvement in homework (homework quality, feedback quality, feedback quantity and autonomy support) and students' use of homework management strategies (organising the environment, managing time, focusing attention, monitoring motivation, and con-

trolling emotions). It was observed that as the quality of teachers' practices in homework planning, homework preparation, feedback and autonomy support increased, students used more homework management strategies. Accordingly, it can be said that teachers' efforts in the dimensions of homework quality, feedback quality, feedback quantity and autonomy support encourage students to use self-regulation strategies. The findings obtained in the framework of teacher homework involvement are consistent with the findings in the literature that teacher feedback and homework quality are positively related to homework management (Corno & Xu, 2004; Xu et al., 2017a, b; Xu, 2023b); Xu & Wu, 2013a, b). The most important factor in this relationship is that students are encouraged to use their self-regulation skills. This is because students use self-regulation skills when they want to. Self-regulation skills, or homework management as it is called in this study, are divided into three phases in terms of frequency of use according to school levels: Primary school is the period when the skills are acquired and used less frequently; secondary school is the period when they are used frequently; and high school is the period when their use is not preferred. The use of self-regulation skills decreases as students progress through secondary school and transition to upper secondary school. Students' motivation for school tasks tends to decrease in later grades throughout their educational careers (Jansen et al., 2022). The fact that self-regulation skills are optional indicates that students will resort to the use of strategies when they want to do homework. In this context, it can be said that factors that increase motivation and desire to do homework will also increase the use of self-regulation skills. Factors such as selecting homework according to students' interests and learning levels and making it interesting motivate students to do homework (Dettmers et al., 2010; Trautwein & Lüdtke, 2009). In addition, students pay more attention to their homework if they know that their homework will be checked. In his study of secondary school students, Xu (2024) found a positive relationship between teacher autonomy support and time management. In particular, research on parental autonomy support is based on self-determination theory (Ryan & Deci, 2024). According to this theory, parental autonomy support was found to have a positive effect on the use of self-regulation skills (Boonk et al., 2018; Wang & Eccles, 2012; Wang et al., 2007; Xu et al., 2018). Therefore, the findings of this study support self-determination theory. From this perspective, it can be said that when teachers' homework efforts are perceived by students, they will make their own efforts in response to teachers' efforts. The use of homework management skills can be seen as an indicator of homework effort.

The findings of this study are consistent with the homework literature and reveal universal aspects of the relationships between teacher homework involvement, self-regulation, and homework behaviour. However, the findings regarding the degree of relationships suggest that the interactions between teacher involvement, students' use of self-regulation strategies, and homework behaviour are influenced by cultural context. In particular, the strong relationship between teacher involvement and homework management/self-regulation differs from previous research. In studies conducted on Chinese middle school students, a low level relationship (mean < 0.20) was found between teacher involvement and self-regulation skills (Guo, 2024; Xu, 2010a, b, 2012, 2023a, b, c; Xu et al., 2017a, b; Xu & Wu, 2013a, b). A subsequent study by Guo and Wei (2019) on Chinese students found a very low relationship between teacher feedback and the use of self-regulation skills. These findings in the literature are significantly lower than the values found in our study. Although Turkey and China both have socialist cultures, this difference is thought to be due to structural differences in educational processes. In China, the homework process is often subject to adult

pressure due to stringent teacher and parental oversight, resulting in students developing less self-regulation skills (McClelland & Wanless, 2015).The argument is made that self-regulation and intrinsic motivation are more likely to be developed in individualistic societies, where students acquire independent study habits without external guidance (Haslam et al., 2019; Xu et al., 2023). In this context, it is predicted that the relationship between teacher involvement and the use of self-regulation skills would be weaker in individualistic cultures. When evaluated in the context of Turkey, it can be said that students are driven by extrinsic factors rather than intrinsic motivation in using self-regulation skills.

Teacher homework involvement, homework management and homework behaviour

The results of this study confirm the hypothesis that teacher homework involvement is positively related to homework behaviour. Accordingly, it can be said that positive teacher behaviour in terms of homework preparation, autonomy and feedback leads to students completing more homework. This study also found that the effect of teacher homework involvement on homework behaviour is much stronger indirectly through homework management than directly. Teacher homework involvement requires teachers to assign homework according to learning principles, students' psychological needs and students' motivation (Rosário et al., 2019a; Trautwein & Lüdtke, 2009). This increases the completion rate of students' homework (Fernández-Alonso et al., 2019; Núñez et al., 2015; Patall et al., 2010; Rosário et al., 2018; Trautwein & Lüdtke, 2009; Xu, 2016). A combination of factors underlies the fact that students complete homework and bring completed homework to school. Firstly, autonomy support and any behaviours that show the student that they are cared for help to satisfy the three psychological needs identified in self-determination theory (relatedness, competence and relatedness). The student is thus intrinsically motivated to complete the task. In addition, the fact that the task is based on the student's interest and that the student is given feedback about his/her situation also increases intrinsic motivation (Ryan & Deci, 2024; Hidi & Renninger, 2006). Students work hard on their homework and expect their efforts to be recognised. They also want to know the difference between those who work and those who do not. Providing quality and frequent feedback meets these student demands (Trautwein et al., 2006). Finally, students' respect for their teachers parallels the effort that teachers put into the teaching process (Murillo & Martínez-Garrido, 2013; Núñez et al., 2015). Students who respect their teachers complete the homework assigned by the teacher. When all these factors are combined in a positive way, students start to complete their homework more often. All these conclusions are supported by the results of many studies. In general, there is a positive relationship between homework quality and homework behaviour (Dettmers et al., 2010; Trautwein et al., 2006; Trautwein & Lüdtke, 2009; Xu, 2016, 2023a, c). Many studies reported that the components of homework quality such as amount of feedback, feedback quality (Hagger et al., 2015; Rosário et al., 2015; Trautwein et al., 2009; Trautwein & Lüdtke, 2009; Xu, 2024a) support for autonomy (Hagger et al., 2015; Xu, 2016; Yang & Xu, 2019) homework behaviour were positively correlated with homework behaviour. In conclusion, teachers who want to increase their students' homework behaviours should start by improving the quality of homework. The research findings support the hypothesis that there is a positive relationship between homework management and homework behaviours. It can be said that students who organise their study environ-

ment, use time effectively, manage distractions, keep their motivation high and control their emotions about homework complete their homework more successfully. The fact that homework is done in an environment without teacher control and that parental control decreases with adolescence increases the need for self-regulation skills for success. Research shows that there is a positive relationship between the use of self-regulation skills or homework management and homework behaviour (Estévez et al., 2018; Núñez et al., 2015; Valle et al., 2019; Xu, 2022; Xu et al., 2015). In this study, it is seen that homework management and homework behaviours have a very high level of interaction. This can be explained by the characteristics of the research group. Secondary school level is the level where students use self-regulation skills the most while doing homework (Bardach et al., 2023; Katsantonis, 2024). At the primary school level, family involvement in homework is at its highest level, with a decrease in active involvement as the levels progress (Boonk et al., 2018). At the secondary school level, where homework is important for students, the effort to succeed is also seen. Therefore, students make use of self-regulation strategies in order to succeed (Patall et al., 2008). The findings of this study reveal the importance of homework management in achieving success in secondary school.

In Trautwein et al.'s (2006) homework model, homework management plays a mediating role between parental behaviour, teacher behaviour and motivation, and homework behaviour. The results of this study support the mediating role of homework management. At the same time, it also shows that the theoretical model is valid in Turkish society, at least to the extent investigated.

The mediating role of grade level and gender

In this study, as a result of the multi-group analysis, it was found that there was a difference between girls and boys. The factor loadings were then compared using the chi-squared difference test to determine the source of the difference. The level of interaction between teacher homework involvement and homework management was similar in both groups. The difference between girls and boys was between teacher homework involvement and homework management. The mediating role of homework management skills is much stronger for girls. While teacher homework involvement directly interacts with homework behaviour for boys, the interaction is mediated by homework management for girls. These findings are in line with the literature. It is generally known that girls spend more time on academic activities and submit higher grades (Avcı et al., 2025a). Accordingly, female students spend more time on homework than male students (Gershenson & Holt, 2015). Girls also generally have significantly better self-regulation than boys (Alghamdi et al., 2020). Girls demonstrate better homework management skills than boys (Aeon et al., 2021; Xu & Corno, 2006). Therefore, the findings of this study support the literature that girls use self-regulation skills more to achieve success.

From another perspective, the results suggest that teacher involvement affects female students more than male students. This may be explained by the fact that female students are more open to teacher guidance. However, studies conducted in different cultures show inconsistent results on whether the effect of teacher support varies by gender. For example, Guo's (2024) study of Chinese 10th graders found that the effect of teacher feedback on self-regulation was similar for male and female students. Similarly, a study conducted with Belgian high school students reported that the relationship between teacher autonomy sup-

port and self-regulation did not differ by gender (Sierens et al., 2009), and a study conducted with German secondary school students reported that there was no gender difference in the effect of autonomy support on self-regulation (Schuitema et al., 2016). However, unlike this study, the finding that teacher involvement had a stronger effect on female students may be due to the fact that teacher-student interactions were more positive and less conflictual for female students, while male students were observed to have more conflictual communication with their teachers (Koepke & Harkins, 2008). In addition, students are known to develop stronger relationships with teachers of their own gender (Kwok & Potter, 2022). The higher proportion of female teachers in Turkey (61%) compared to male teachers is a factor that should be taken into account when interpreting these findings (MoNE, 2025). These differences suggest that the impact of teacher engagement on gender may be influenced by cultural and contextual factors. The nature of teacher-student interactions, classroom dynamics, and social norms may lead to different effects of teacher support on male and female students. Therefore, cultural context must be taken into account when understanding the relationship between teacher engagement and gender.

As a result of the multi-group analysis, it was found that there was a difference between 5th-6th grade and 7th-8th grade. Subsequently, the Chi-square difference test showed that there was no difference between the two groups in terms of factor loadings. In multi-group analysis, in addition to factor loadings, cut-off points and error variances are also tested. Therefore, the difference may be between the other remaining measures. Although not statistically significant, the factor loadings partially differed according to grade level. The difference between the two groups is between teacher homework involvement and homework behaviour. While in the older group there is a direct interaction between the two variables, in the younger group the interaction is indirect through homework management. Accordingly, it can be said that the mediating role of homework management strategies decreases with grade level. These findings are in line with the literature. In parallel with the increase in grade level, students enjoy doing homework less (Camacho-Morles et al., 2021), they find homework less valuable (Avcı et al., 2025a), they like homework less (Núñez et al., 2019). As a result, they use fewer self-regulation strategies as they progress through the grades (Bardach et al., 2023; Katsantonis, 2024). In this study, a decrease in the role of self-regulation skills was observed in parallel with the increase in grade level. Younger students tend to use self-regulation more to achieve success.

Multigroup analysis revealed significant differences between 5th-6th and 7th-8th graders in the structural relationships between homework quality, homework management, and homework behaviour. Although the factor loadings remained constant across groups (as confirmed by the chi-squared difference test), differences were found especially in the structural pathways. While the effect of homework quality on homework management was similar in both groups, the effect of homework management on homework behaviour was significantly stronger in 7th-8th graders. This finding suggests that the effect of self-regulation skills increases with grade level. In addition, although the direct effect of teacher involvement (in terms of homework quality) on homework behaviour did not differ significantly between groups, this effect was indirectly mediated by homework management in both groups; this mediation was more pronounced in the younger age group. This suggests that when younger students are able to effectively manage assignments that they perceive to be of high quality, their behaviour toward those assignments is more positively shaped. According to the literature, as grade level increases, students enjoy doing homework less

(Camacho-Morles et al., 2009), find homework less valuable (Avcı et al., 2025a) and their positive attitudes toward homework decrease (Núñez et al., 2019). There is also a decrease in the use of self-regulatory strategies (Bardach et al., 2023; Katsantonis, 2024). However, the results of this study show that high school students use homework management strategies more effectively.

Conclusion

As a result of this study, it was found that the teacher's efforts to improve the quality of homework had a high level of interaction with the students' use of homework management skills. Students who use homework management skills at a high level are more likely to complete their homework. The interaction between teacher homework involvement and homework behaviour is positive both directly and indirectly through homework behaviour. The interaction between the two variables is primarily mediated by homework management skills. Female students and students in grades 7 and 8 use homework management skills more effectively as a means of achieving success.

The findings provide insights for teachers and parents that can guide practical applications. There is a large body of literature on how to do homework more effective. The results of this study once again emphasise the importance of effective homework preparation. If students are expected to do homework, teachers should start by improving the quality of the homework. In summary, homework should be based on students' interests, abilities and needs, students should be given alternatives to choose from, and students should be given frequent and detailed feedback (Trautwein & Lüdtke, 2009). An important aspect of homework quality is that students' perceptions should be positive (Dettmers et al., 2010). Teachers may use quality practices according to their own perceptions, but if they are not perceived as such by students, their reflection on the results will be insufficient. Teachers may assign homework for many different reasons. Students are more likely to benefit from assignments that are related to the classroom, involve real-life problems, and offer choices, and they dislike repetitive and rote assignments (Zhou et al., 2020). The level of difficulty of homework should be challenging to students' cognitive abilities. While challenging tasks increase success, repetitive tasks decrease it. Assignments designed with learning speed in mind should be slightly above the potential of the target group (Dettmers et al., 2010). Homework is more effective when it is organised according to students' characteristics, interests, and needs. Students benefit most from homework when it is tailored to their needs (Zakharov et al., 2014). Students only benefit from homework if it is checked. When teachers provide feedback on homework, regardless of its type, homework success increases (Rosário et al., 2015). More importantly, the feedback should be specific and informative (Zhou et al., 2020).

The quality of homework also promotes the use of homework management strategies. This is all the more important given the strong interaction between homework management strategies and homework behaviour. Studies should be conducted to promote the use of homework management strategies, especially among male students and upper secondary students. Teachers may prefer practices such as families' supportive approach to homework, doing homework interesting, teachers' providing informative and student-specific feedback,

and respecting students' choices to motivate the use of homework management skills (Xu, 2016, 2024; Xu et al., 2017a, b; Xu & Wu, 2013a, b).

Limitations and future research

In addition to many important findings, this study has several limitations. Firstly, the data in the study were obtained using a cross-sectional design. Therefore, the results only indicate the direction and strength of the relationship between the variables and prevent inferential conclusions. Longitudinal studies can be conducted to determine the direct and indirect effects of teacher homework involvement on homework behaviour. Another limitation of this study is that all findings are based on students' perceptions. Although teacher homework involvement studies emphasise that it is student perceptions rather than teacher statements and practices that determine student behaviour, findings based on teacher practice should be obtained both to further test this finding and to see the effect of the real situation on student behaviour. Similarly, students' homework practice can be measured for homework behaviour. The third limitation is the cultural and regional sample structure of the study. The results obtained belong to the Turkish culture and urban lifestyle. This should be considered when generalising the findings. The last limitation of the study is the application of the measurement instruments according to the mathematics homework. The course or subject area in which the research is focused may affect students' attitudes and performance in relation to homework. Therefore, comparisons and practical applications should consider the domain-specific nature of the data presented. Conducting similar studies for different courses would be more generalizable and would provide guidance for more general findings.

Author contributions SA conceived and designed the research framework, developed the methodology, and wrote the original draft of the manuscript. MÖ was responsible for data collection, contributed to the writing and reviewing of the manuscript, and assisted in the interpretation of results. AA conducted the data analysis, supported the development of the manuscript, and contributed to the final review and editing process.

Funding Open access funding provided by the Scientific and Technological Research Council of Türkiye (TÜBİTAK). This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval This study received approval from the Ethics Committee of Sabahattin Zaim University. The research was conducted in accordance with the principles outlined in the Declaration of Helsinki.

Competing interests The authors declare that they have no competing interests.

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