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The relationship between the quality of homework, the experience of anger during homework and the performance of secondary school students in the subject "German"

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ABSTRACT

This study examines the relationship between aspects of homework quality (embedding homework in the teaching-learning process and differentiation), students' anger experienced while completing German homework (language of instruction), and orthography performance. In total, 410 students from 23 eighth-grade classes in the Swiss canton of Bern have been surveyed. To date, no studies have investigated the relationship between either of the two qualitative aspects and anger as a specific emotion. Multilevel mediation models showed that at the student level, students' anger about homework contributed to a significant indirect effect of perceived embedding of homework in the teaching-learning process on students' orthography performance. However, no significant indirect effect of perceived differentiation in homework on performance was found. The results can guide the adaptation of the training and further education of teachers to enable them to give high-quality homework that does not trigger anger in students and, conversely, can positively impact their performance.

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Anger; differentiation; homework; homework quality; orthography performance

Introduction

As part of everyday school life for many students, various facets of homework have been researched, with particularly intensive investigations considering whether homework improves performance (e.g. Chin, Lin, and Chen 2022; Trautwein, Niggli, et al., 2009). Several studies have found that effort is a crucial aspect when it comes to the effectiveness of homework (Schnyder et al. 2006; Trautwein, Lüdtke, Kastens, et al. 2006; Trautwein, Lüdtke, Schnyder, et al. 2006). In turn, motivation and the associated effort are influenced by the quality of the homework (Dettmers et al. 2010; Rosário et al. 2018) and the emotions experienced while undertaking homework (Dettmers et al. 2011; Goetz et al. 2012; Liu et al. 2019). Previous studies have shown that student achievement is negatively associated with the experience of negative emotions and that students who

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gave a high rating to homework quality reported fewer negative emotions during the homework process (Dettmers et al. 2011).

However, it is notable that none of those studies considered distinct emotions. Emotion research has demonstrated the importance of distinguishing emotions, which have unique effects on learning and achievement (e.g. Pekrun and Linnenbrink-Garcia 2014). Hence, according to Pekrun et al. (2023), to obtain a differentiated picture of the link between emotions, student learning, and student achievement, it is critical not only to summarise emotions into constructs based on valence but also to pursue approaches that focus on specific emotions.

Adopting this argument, the present study focuses on one specific negative emotion: students' homework-related anger. Evidence from previous research suggests that how homework is assigned to students can evoke anger (Dettmers et al. 2011; Trautwein 2007). More generally, results suggest that anger is negatively related to both the learning effort reported by students and student achievement (Pekrun et al. 2011). This suggests the crucial need to not only better understand how anger relates to homework practice but also gain insight into the effect of anger on student achievement. This study focuses on the subject "German", one of the main subjects in Switzerland and a subject for which homework is assigned regularly. A domain-specific approach is vital because homework practices and emotions vary between subjects (e.g. Goetz et al. 2006).

Homework

Homework has been defined as tasks assigned to students by teachers to be completed outside of school hours (Cooper 1989, 7). Homework can fulfil different functions: it can be given to provide parents or guardians with insight into school activities, which corresponds to the social function of education (Cooper 1989; Trautwein, Schnyder, et al. 2009). It can serve a pedagogical function by encouraging self-regulated learning and stimulating interest (Niggli, Trautwein, and Schnyder 2010; Trautwein, Schnyder, et al. 2009). Finally, homework can be assigned to give students additional learning time, lending it a didactic-methodical function (Niggli, Trautwein, and Schnyder 2010; Trautwein, Schnyder, et al. 2009). This extra learning time allows students to practice what they have already learned and prepare for subsequent lessons and encourages the learning of students who participate less in class than others (van Voorhis 2004; Warton 2001).

Much of the extant literature on homework concerns the didactic-methodical function, investigating the effects of homework on academic achievement (e.g. Cooper, Robinson, and Patall 2006; Tsang, Dang, and Moorhouse 2022). The homework model proposed by Trautwein and their collaborators (Trautwein and Lüdtke 2007; Trautwein, Lüdtke, Schnyder, et al. 2006) describes the complex interrelations between the main actors involved in the homework process (students, teachers, and parents/guardians), their experiences and their behaviour, and homework's implications for academic achievement. The model assumes that student achievement depends on homework behaviour (homework effort, homework time, and learning strategies), with homework behaviour influenced by the learning environment, the teacher, homework characteristics, individual characteristics, and support from parents/guardians. Empirically testing in several studies (Dettmers et al. 2010; Trautwein and Lüdtke 2007, 2009; Trautwein, Lüdtke, Kastens, et al. 2006; Trautwein, Lüdtke, Schnyder, et al. 2006) has crucially recognised that the quality of

homework has a decisive influence on first homework behaviour and, consequently, student performance (Dettmers et al. 2010; Rosário et al. 2018; Xu et al. 2021, 2022). Meanwhile, an extension of this model proposed by Dettmers et al. (2011) integrated student emotions as core variables characterising the quality of the learning process. This suggests that the quality of the homework practice impacts not only learning behaviour but also emotions, in turn affecting student achievement. As such, emotions can be described as significant attributes that provide insight into the complex mechanisms connecting homework practice to student achievement.

Homework quality

When students give the quality of homework a high rating, they have been observed to demonstrate more engagement and make more effort (Dettmers et al. 2010; Rosário et al. 2018; Trautwein and Lüdtke 2007, 2009; Trautwein, Lüdtke, Schnyder, et al. 2006), with high engagement or effort improving achievement outcomes (Rosário et al. 2018; Trautwein, Lüdtke, Schnyder, et al. 2006). Previous homework research has identified different quality criteria regarding the didactic-methodical function. For example, homework should be cognitively challenging and activating (Cooper 1989; Dettmers et al. 2010; Lipowsky et al. 2004), teachers should give homework regularly but not too extensively (Cooper 1989; Trautwein et al. 2001; Trautwein et al. 2002), and homework should be embedded in the teaching-learning process and related to the content of the lesson (Hascher and Hofmann 2008; Rosário et al. 2018; Trautwein and Lüdtke 2007). In addition, checking the solutions of homework––rather than simply checking that homework has been completed––positively impacts achievement (Lipowsky et al. 2004). Finally, the fit between the requirements of the homework and the abilities of the students also represents an important quality feature (Dettmers et al. 2010). To achieve the best possible fit, homework should be differentiated (Paradies and Linser 2005).

This study highlights two quality aspects: embedding homework in the teaching-learning process and differentiation of homework. Embedding homework in the teaching-learning process is important because the quality of homework is rated high by students when it is linked to goals that students can relate to their classroom work (Rosário et al. 2018). If students rate the quality of homework high, they put more effort into their homework, which can impact achievement (Rosário et al. 2018). Differentiation describes a solution to the problem of identical homework for all students corresponding to a frequently less-than-optimal fit due to the heterogeneity of the students (Chen 2022). For Kohler (2008), the undifferentiated practice of homework is one reason why homework does not improve achievement on average. Additionally, perceived low homework quality affects students' perceived emotions during homework completion (Dettmers et al. 2011).

Student emotions

Emotions are relevant to the learning process because they drive the cognitive, motivational, and behavioural processes underpinning achievement (Pekrun et al. 2023). According to the Control-Value Theory (CVT; Pekrun 2006), positive (i.e. positively experienced) emotions promote approach motivation and effort (Pekrun et al.

2023), the use of flexible learning strategies (e.g. elaboration of learning material; Pekrun et al. 2007), and achievement (Pekrun et al. 2002, 2023). In contrast, negative (i.e. negatively experienced) emotions are likely to trigger avoidance or withdrawal, reduce effort (Pekrun et al. 2023), and divert attention from the activity, which can lead to task-irrelevant thinking, reduce the cognitive resources available for the task, and impair performance that requires those resources (Pekrun and Linnenbrink-Garcia 2012; Pekrun et al. 2007). As in the case of classroom learning, it can be assumed that emotions related to homework also importantly impact student learning and achievement.

As discussed in the previous section, Dettmers et al. (2011) integrated emotions in the homework model using several core premises on CVT and found that mathematics achievement was negatively related to experiencing negative emotions during mathematics homework. Students who experienced high levels of negative emotions during homework recorded lower mathematics achievement gains than students who exhibited lower levels of negative emotions.

In another study, Trautwein and colleagues (Trautwein, Niggli, et al. 2009) investigated the prediction of student emotions based on teachers' statements regarding homework goals, practical implementation, and attitudes towards parental involvement. They found that students of teachers who stated that their goal was to establish a connection between school and home showed a comparatively unfavourable development of students' emotions during homework. In terms of practical implementation, they found that a controlling homework style on the part of the teacher (i.e. mainly using homework to monitor student effort and assess students) was associated with an increase in negative emotions among students. Finally, regarding attitudes towards parental support, there was a positive development of emotions among students in classes whose teacher strongly favoured student autonomy.

In a similar vein, Dettmers et al. (2011) also found significant links between the quality of homework and students' emotions. More concretely, students from classes that rated the quality of homework high reported fewer negative emotions. They also showed a student-level curvilinear relationship between perceived homework challenge and negative emotions during homework completion, with very high and very low levels of perceived challenge being associated with negative emotions. Mediation analyses revealed that student emotions related to homework mediate the relationship between homework quality and mathematics achievement at the student and class level (Dettmers et al. 2011).

Because homework is often completed by students at home, parents and guardians can also impact student emotions (Liu et al. 2019; Moè, Katz, and Alesi 2018). Moè et al. (2018) showed that parents who support students in an autonomy-supportive way with their homework relates to their emotions while assisting with it. In addition, the positive emotions of parents relate positively to the positive emotions of students and vice versa.

In summary, aligning with the CVT (Pekrun 2006) and the homework model proposed by Trautwein and colleagues (Trautwein and Köller 2003; Trautwein and Lüdtke 2009), the perceived learning environment––as indicated by, for example, the quality of the homework and parental support – relates strongly to student emotions. In turn, these emotions are important attributes of the learning process and contribute to student achievement.

The present study

As discussed, the differentiation of homework and the embedding of homework in the teaching-learning process are important and decisive quality features for the effectiveness and efficiency of homework (Dettmers et al. 2010; Rosário et al. 2018). Previous findings make apparent that differentiation does not directly improve performance but that the relationship is mediated by affective and motivational components (Müller et al. 2021). For the present study, the negative emotion of anger has been chosen as a mediator based on the assumption that various aspects of homework can lead to anger. For instance, support from parents or guardians may lead to anger or anger-inducing domestic interactions regarding homework. Furthermore, the perceived quality of homework can also trigger anger by, for example, seeming unrelated to the lesson (i.e. not embedding homework in the teaching-learning process) or not matching student abilities (i.e. lack of differentiation). In theory, differentiation ensures that teachers consider the different learning characteristics of different students (such as interests, abilities, and cultural backgrounds), promoting equal opportunities for all (Jager et al. 2022). However, because students compare their homework, negative emotions, especially anger, may arise when they feel disadvantaged or unfairly treated. This has been observed in the study by Feiss, Hagenauer, and Moroni (2025), which recorded teachers indicating that children often do not want different homework, making differentiation a problem. From the teachers' perspective, students often do not want to stand out or be treated differently from other students (Feiss et al. 2025). In contrast, embedding homework in the teaching-learning process may reduce student anger because students are more likely to see the sense of the homework. However, no existing studies have investigated either of the two quality aspects or their connection with emotions, making this study critical. In addition, previous studies have generally used a positive or negative affect scale (Dettmers et al. 2011; Trautwein, Niggli, et al. 2009), with no existing study focusing on any specific emotion (to the best of our knowledge).

Prior research has also shown that emotions and homework are domain-specific (Goetz et al. 2007; Trautwein, Lüdtke, Schnyder, et al. 2006). In Switzerland, mathematics, German, and French are the three main subjects, and previous studies have mainly focused on mathematics (e.g. Dettmers et al. 2011) or French (as a second language, e.g. Trautwein, Niggli, et al. 2009). This study focuses on emotion, homework quality, and performance in the specific domain of German (the language of instruction in our sample). As an indicator of achievement, we have chosen orthography performance because orthography skills are fundamental to achievement in many subjects. To date, little is known about the link between student emotions and orthography performance. Only the study by Fischer (2022) found a negative correlation between orthography performance and the negative emotion of shame. With regard to anger, it can be assumed that students who are annoyed also perform less well in orthography, as they are less likely to take advantage of learning opportunities that arise through homework.

Against this backdrop, this study addresses the following two research questions:

RQ 1: To what extent do aspects of perceived homework quality in German (embedding homework in the teaching-learning process and differentiation) relate to students' orthography performance and their experience of anger during homework completion?

We propose that high perceived quality of homework––indicated by (a) embeddedness of the homework in the learning process and (b) differentiation––is negatively associated with students' anger related to homework completion and positively associated with students' achievement in German as indicated by their performance in orthography (Hypothesis 1a and Hypothesis 1b).

RQ 2: To what extent does the anger experienced by students during German homework mediate the connection between the aspects of perceived homework quality (embedding in the teaching-learning process and differentiation) and orthography performance?

As proposed in the model described by Dettmers et al. (2011), it is assumed that students' anger in relation to German homework mediates the connection between the embeddedness of the homework in the learning process (Hypothesis 2a) and homework differentiation (Hypothesis 2b) and orthography performance

Methods

Sample and procedure

A total of 410 Swiss students (51.5% female) from 23 eighth-grade classes of the high-track secondary level were surveyed, with an average age of 14.34 years ($SD = 0.57$). The gender distribution of the sample corresponds to the cantonal distribution (FSO 2024). The sample derives from a study on homework in the subject of German (primary language) conducted by researchers at the University of Teacher Education in Bern in 2017 in the German-speaking part of the Swiss canton of Bern. All secondary school principals in the canton were contacted and asked to inform their teachers about the project using an informational flyer. The teachers then volunteered to take part in the project. The schools are evenly distributed across urban and rural areas. About 20% of the students had a migration background (both parents were not born in Switzerland). Information on the language composition of the sample can be found in Table 1.

The work presented in this paper was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for research involving human participants and in accordance with the APA ethical standards. For all participating students in the study, parents gave their written informed consent in accordance with the Declaration of Helsinki and had the right to withdraw from the study at any time.

Instruments

Table 2 presents the specific items and Cronbach's alpha's for the scales used for students' anger related to homework (Schnyder, Niggli, and Trautwein 2008), embedding homework in the teaching-learning process (Schnyder, Niggli, and Trautwein 2008), differentiation in homework, and parental homework support (Dumont et al. 2014).

Table 1. Language composition of the sample.

Frequency of use of the German language at home	
rarely or never	9%
sometimes	18%
always	72.2%
Language spoken at home	
Swiss German	86.3%
German	3.4%
French	0.2%
Portuguese	0.2%
South Slavic (Bosnian, Croatian, Macedonian, Serbian, Slovenian)	2.0%
Albanian	1.5%
Turkish	0.5%
English	0.2%
other language	5.4%

Table 2. Scales with the specific items and the Cronbach's alpha.

Scales	Item	N	α
student anger related to homework	"I have a real aversion to German homework". "I often get annoyed about German homework while I'm doing it". "If I have to sit there for a long time and do German homework, I get all restless with anger". "German homework is a real burden for me".	407	.82
Embedding homework in the teaching-learning process	"Our teacher knows what homework to give us so that we understand the subject matter". "Our teacher puts a lot of effort into the homework discussion". "The homework is always well integrated into the lessons". "The homework discussions often help you to really understand the tasks you have done".	409	.73
differentiation in homework	"How often do better students get homework different from the rest of the class?" "How often do weaker students get homework different from the rest of the class?"	408	.77
parental homework support	"My mother/father helps me with my homework when I ask them to". "My mother/father always helps me with my homework when I have difficulties with it". "I can always talk to my mother/father about my homework". "When I do my homework, my mother/father does not tell me straight away what I should do but listens calmly to how I would solve my tasks".	410	.78

Note. min = 1 (not at all true), max = 4 (quite true); α = Cronbach's alpha.

Confirmatory factor analyses were conducted to test the assumed factor structure. The fit indices of root mean squared error of approximation (RMSEA) < .07, SRMR < .08, comparative fit index (CFI) > .90, and factor loadings (λ) > .50 were used to assess the model fit (Tabachnick and Fidell 2013). For students' anger related to homework, items with low factor loadings (λ < .50) were identified. After adjustment, four of the original five items achieved satisfactory to good fit values.

Student gender (0 = male; 1 = female), parental homework support, and HISEI (Highest International Socio-Economic Index of Occupational Status of Parents) were used as covariates. The parental homework support scale was measured by calculating mean values from identical scales for mothers and fathers (Dumont et al. 2014). Both parents stated their occupation, which was classified using the International Standard Classification of Occupation (ISCO-88(COM)) and then converted into the International

Socio-Economic Index, with the higher value used for the analyses (Ganzeboom, de Graf, and Treiman 1992).

Students' orthography performance was assessed using the HSP (Hamburger Schr eibprobe) 7–8 (May, Malitzky, and Vieluf 2019). The HSP provides standardised information about student ability in Grades 7 to 8 in orthography and key orthographic strategies (May, Malitzky, and Vieluf 2019). Students' orthography performance was tested during a regular school lesson. Some changes were made for the Swiss context, such as replacing the "eszett" (ß) with "ss".

Data analysis

Descriptive statistics and bivariate correlations were investigated before conducting the main analyses. All analyses were performed in R (R Core Team 2019). Because students are nested within classes (Huang 2018; Julian 2001), a latent multilevel mediation model was performed to examine the effects of embedding homework in the teaching-learning process and differentiation in homework on student anger related to homework and orthography performance. A 1-1-1 multilevel mediation model was estimated using lavaan (v. 0.6–2; Rosseel 2012), with all variables measured at the student level and all paths allowed to vary between classrooms (Zhang, Zyphur, and Preacher 2009). Maximum likelihood estimation was used to address missing data (0.03%). Model fit was assessed by examining the comparative fit index (CFI), the root mean squared error of approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). A satisfactory model fit is indicated by a CFI > .90 (Tabachnick and Fidell 2013), an RMSEA < .07 (Steiger 2007), and an SRMR < 0.10 (Kline 2016). Two independent multilevel mediation analyses were conducted, using embedding homework in the teaching-learning process and differentiation in homework as predictors. Student anger related to homework was adopted as mediator in both models.

Results

Descriptive statistics and intercorrelations

Descriptive statistics and correlations for all variables appear in Table 3. With regard to the empirical scale mean, students rated the factors *embedding homework in the teaching-learning process* ($M = 3.09$, $SD = 0.55$) and *parental homework support* ($M = 3.31$, $SD = 0.56$) relatively high. Meanwhile, *differentiation in homework* ($M = 1.29$, $SD = 0.49$) and *anger related to homework* ($M = 1.73$, $SD = 0.62$) were rated rather low. HISEI was 57.55 ($SD = 20.10$), slightly higher

Table 3. Means, standard deviations, and correlations.

	M	*SD*	1	2	3	4	5
1. embedding in the teaching learning process[a]	3.09	0.55					
2. differentiation[a]	1.29	0.49	−.02				
3. students' anger[a]	1.73	0.62	−.30***	.09			
4. parental support[a]	3.31	0.56	.19***	−.15**	−.13**		
5. HISEI	57.55	20.10	.01	.12*	−.00	.16**	
6. orthography performance	439.56	21.14	.05	−.10	−.23***	.08	−.05

Note. [a]min = 1, max = 4; *M* = mean; *SD* = standard deviation; *$p < .05$. **$p < .01$ ***$p \leq .001$.

than the average for Swiss students ($M = 53.0$; Konsortium PISA.ch 2019). The sample mean score for orthography performance was 439.56 points ($SD = 21.14$) out of a total of 472 points, aligning with the expected range.

The correlation table (see Table 3) shows that the perceived embedding of homework in the teaching-learning process is negatively related to the homework-related anger experienced by students ($r = -.30$; $p \leq .001$) and positively related to parental homework support ($r = .19$; $p \leq .001$). The differentiation in homework is significantly negatively related to parental homework support ($r = -.15$; $p < .01$) and positively to the HISEI ($r = .12$; $p < .05$). Student anger related to homework is significantly negatively related to parental homework support ($r = -.13$; $p < .01$) and to orthography performance ($r = -.23$; $p \leq .001$). Parental homework support is positively correlated with the HISEI ($r = .16$; $p < .01$).

Testing the interrelations between quality of homework, student anger, and orthography performance

To examine whether student anger related to homework mediates the relationship between perceived embedding of homework in the teaching-learning process or perceived differentiation in homework and orthography performance, multilevel mediation modelling was conducted. The multilevel mediation model with perceived embedding of homework in the teaching-learning process as predictor yielded a satisfactory model fit (RMSEA= .000, CFI = .898, $SRMR_{within}$= .001; $SRMR_{between}$= .034). The results revealed that 14% of the variance of perceived embedding in the teaching-learning process, 5.6% of students' anger related to homework, and 1.7% of orthography performance can be attributed to the fact that students are nested within classrooms, indicating the need for multilevel analyses (Huang 2018; Julian 2001). As Figure 1 shows, there are no significant effects at the classroom level. At the student level, the results reveal significant direct negative relationships between perceived embedding of homework in the teaching-learning process and student anger related to homework ($\beta = -.214$, $p \leq .001$) and between student anger and orthography performance ($\beta = -.200$, $p \leq .001$) after controlling for gender, parental support, and HISEI. Gender and parental support negatively impacted student anger related to homework and positively impacted orthography performance. Female students and students with higher parental support for homework reported experiencing significantly less homework-related anger. Female students and students with higher parental support also demonstrated better orthography performance.

The results also reveal a significant positive indirect effect of perceived embedding of homework in the teaching-learning process on student orthography performance via student anger related to homework ($\beta = 0.043$, $p < .05$). This is consistent with hypothesis 2a that students' anger related to homework mediates the relationship between perceived embedding in the teaching-learning process and orthography performance.

The multilevel mediation model with perceived differentiation in homework as predictor yielded satisfactory model fit (RMSEA= .000, CFI = .999, $SRMR_{within}$= .001; $SRMR_{between}$= .041). The results show that 12.68% of the variance of perceived differentiation in homework, 5.5% of student anger related to homework, and 1.7% of orthography performance are due to students being nested in classes, again suggesting the need for multilevel analyses. As Figure 2 shows, no significant effects could be found at the class

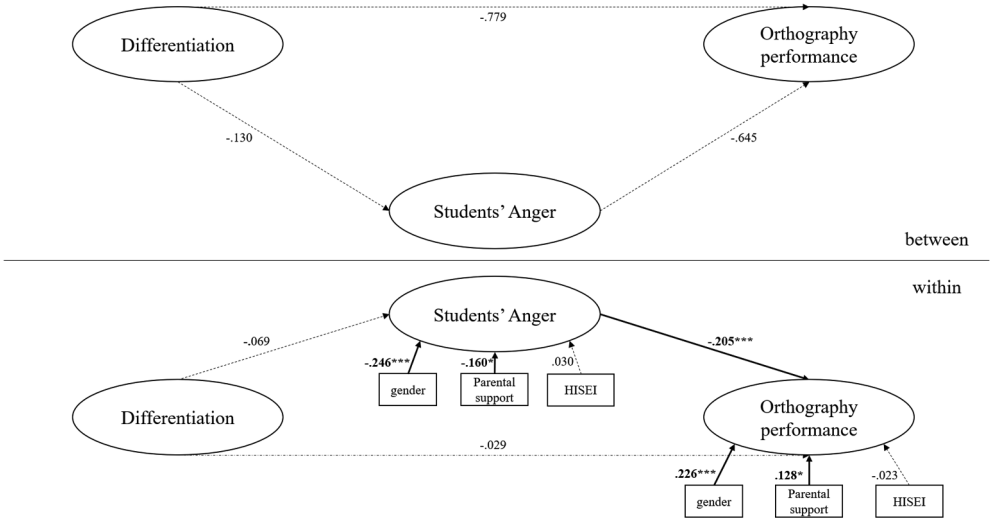

Figure 1. Mediation model with perceived embedding in the teaching-learning process as predictor. Non-significant effects are represented using dashed lines, and significant effects are represented using solid lines; *$p < .05$, **$p < .01$, ***$p \leq .001$. All parameters of the multilevel model are displayed in Table A1 in the appendix.

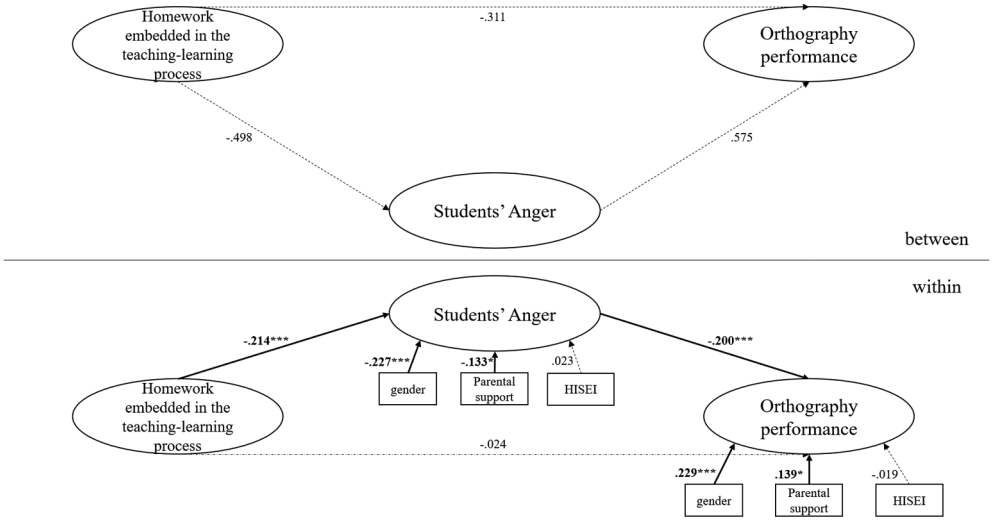

Figure 2. Mediation model with perceived differentiation in homework as predictor. *Note*. Non-significant effects are represented using dashed lines, and significant effects are represented using solid lines; *$p < .05$, **$p < .01$, ***$p \leq .001$. All parameters of the multilevel are displayed in Table A2 in the appendix.

level. At the student level, a negative direct relationship was observed between students' anger related to homework and orthography performance ($\beta = -.205$, $p \leq .001$) after controlling for gender, parental support, and HISEI. As in the case of Model 1, female students and students with higher parental support for homework reported experiencing

significantly less homework-related anger and demonstrated better orthography performance. In contrast to the first model, this model revealed no direct relationship between perceived differentiation in homework and student anger related to homework, implying that no significant indirect effects were found. This observation contradicts hypothesis 2b that student anger related to homework mediates the link between perceived differentiation in homework and orthography performance.

Discussion

The present study aimed to investigate the relationship between aspects of homework quality (homework embedded in the teaching-learning process and differentiation), student anger related to homework, and orthography performance.

As anticipated by Hypothesis 1a and aligning with the results of Dettmers et al. (2011) regarding homework quality, the embedding of homework in the teaching-learning process is negatively related to student anger and positively but not significantly related to orthography performance. Students who believe that homework is well integrated into the teaching-learning process experience significantly less anger when doing homework than students who disagree.

Regarding differentiation, there were no significant relationships between differentiation of homework, student anger related to homework, and orthography performance, leading to the rejection of Hypothesis 1b. This result is surprising because one might assume that differentiated homework practice would lead to a better fit between the assigned homework and student skills, which might be expected to reduce anger. First of all, the operationalisation of differentiation as a possible limitation in this study should be mentioned. Differentiation was only measured with two items and only differentiation considering students' performance level was recorded. This means that the many forms that differentiation of homework can take were not taken into account accordingly. Furthermore, no information is available on the quality of the differentiation (e.g. task quality). In addition to this methodological explanation of the non-significant result, however, content-related explanations may also be decisive. Two opposing effects might be occurring here. On the one hand, a differentiated homework practice might reduce student anger by improving the fit. On the other hand, student anger might be increased because students feel unfairly treated if different homework is assigned to different students. It is also possible that students feel over- or underestimated when differentiated tasks are assigned, leading to anger. Therefore, future studies should investigate in greater depth how students experience differentiated homework, especially from the perspective of perceived fairness. From the teacher's perspective, at least one previous study has already revealed that teachers have concerns that students might experience differentiated homework as unfair (Feiss, Hagenauer, and Moroni 2025). More generally, Müller et al. (2021) have recognised that much remains unknown about the extent to which measures of differentiation are associated with affective-motivational aspects of students. This is also the case for homework as a specific part of teaching. In the present study, the emotion anger was chosen, and no connection with differentiation was found. According to earlier studies (Daschmann, Goetz, and Stupnisky 2014; Krannich et al. 2019),

boredom is evidently associated with over- and underchallenge. This suggests the possibility that boredom, rather than anger, is the emotion most frequently experienced in connection with a lack of differentiation.

Another noteworthy result was that – from the students' perspective – very few teachers assigned differentiated homework. The students rated the differentiation between 1 (never) and 4 (always) and arrived at a mean value of 1.29. This low mean value might also have contributed to the non-significant relationship observed between differentiation and anger, providing a statistical explanation for the rejection of Hypothesis 1b. However, the very low mean value is entirely consistent with findings from previous studies (Hagenauer and Oberwimmer 2019; Hascher and Hofmann 2008) Similarly, Pozas, Letzel, and Schneider (2020) found that although teachers generally adopt differentiation practices in the classroom, the frequency does not meet the recommendations for successfully addressing heterogeneity, with the reasons for the lack of differentiation potentially associated with increasing the challenge for teachers in the form of increased workload, complications with the provision of feedback to students or integrating homework into lessons, not making a habit giving differentiated homework, a lack of professional knowledge, or a lack of suitable materials and assignments (Feiss, Hagenauer, and Moroni 2025).

Regarding Hypothesis 2, which concerns anger's mediator role, the results reveal that student anger mediates the relationship between the embedding of homework in the teaching-learning process and orthography performance. This result aligns with those produced by the model developed by Dettmers et al. (2011) and indicates that although the embedding of homework in the teaching-learning process as a homework quality characteristic does not directly affect students' orthography performance, it is important for students' emotional experience during homework completion, which impacts their orthography performance. For example, students of teachers who embed their homework in the teaching-learning process experience fewer negative emotions during the homework process and therefore achieve better orthography results. This emphasises the importance of embedding homework in the teaching-learning process as a quality aspect, as already established by Rosário et al. (2018) and Trautwein and Lüdtke (2007). This mediation effect could not be found for differentiation.

Finally, the results also reveal some interesting findings for the covariates. Female students experienced less anger in relation to homework and recorded better results for orthography performance. Previous studies have produced heterogeneous results in relation to gender differences in the experience of anger at school (Buntaine and Costenbader 1997; Ghanizadeh 2008).

In addition, students with more parental support experienced less anger in relation to homework and produced better results in orthography performance. The results of previous studies on parental support and student performance vary (Silinskas and Kikas 2019). For example, Knollmann and Wild (2007) observed no differences between different parental support styles in terms of anger experienced by students, while Liu et al. (2019) found that students with greater parental support experienced more positive and fewer negative emotions related to homework.

Strengths, limitations, and future research

This study has certain strengths and limitations. One strength of this study is its focus on a specific negative emotion and not positive or negative affect in general (e.g. Dettmers et al. 2011). In addition, specific indicators of homework quality (the embedding of homework in the teaching-learning process and differentiation) were investigated rather than an overall measure of homework quality. Therefore, this study provides a more detailed picture of the relationships existing within the homework process.

Despite these strengths, certain limitations should be considered when interpreting the results. Because it was not possible to test for the causal ordering of the variables, longitudinal studies are encouraged as an avenue for further research. In addition, the data used are based on self-reports from students, which has the advantage of providing important insights into how students perceive situations but also carries the risk of socially desirable responses. Therefore, future studies might have experts rather than students assess the quality of homework.

Previous research has demonstrated that homework effort importantly impacts effectiveness (Fernández-Alonso and Muñiz 2021; Trautwein, Niggli, et al. 2009; Trautwein, Schnyder, et al. 2009). Unfortunately, effort during homework was not measured on a subject-specific basis, preventing its inclusion in the model. In addition, a previous study has shown that teachers believe that students do not want differentiated homework or are critical of it (Feiss, Hagenauer, and Moroni 2025). The present study has observed no significant correlation between the differentiation of homework and students' perceived anger. Therefore, future studies should qualitatively analyse student attitudes towards differentiated homework to potentially garner important insights for teachers regarding the design of high-quality homework.

As this study only examined secondary school students in a very specific context – the canton of Bern in Switzerland – the results may not be generalisable to other contexts (e.g. more diverse classrooms). Hence, future studies should investigate differentiation in homework in a more differentiated way and in further contexts in order to further illuminate the links with student emotions and performance. Especially when orthography performance is chosen as an indicator of performance, the linguistic background of the students is likely to play an important role. It is to be expected that in linguistically diverse classrooms, the association between homework practice, emotions and performance is even more complex and that high-quality differentiation of homework becomes even more important.

Anger was chosen as a specific emotion based on its assumed importance in connection to the two selected quality aspects. As discussed, boredom represents another specific emotion that could be investigated in connection to homework differentiation. Boredom could be interesting given its documented associations with over- and underchallenge (Daschmann, Goetz, and Stupnisky 2014; Krannich et al. 2019). Hence, if future studies take further student emotions into account, the understanding of the relationship between emotions and homework will be expanded, allowing even more specific implications to be derived.

Conclusion and practical implications

This study provides novel insights into the relationships between aspects of homework quality, student anger in relation to homework, and orthography performance. Overall, the results confirm that students who perceive homework to be embedded in the learning process experience less anger, with this association not evident for the link between differentiation and student anger. However, this null finding must be interpreted in the context of the very brief and economical measurement of differentiation, possibly leading to an underestimation of the effects of high-quality differentiation on students' anger.

These results have some implications for teacher training and further education. First, both teacher trainees and in-service teachers should acquire the skills to embed homework in the teaching-learning process in high-quality ways. Furthermore, the finding that only a few teachers assigned differentiated homework suggests that adequately addressing heterogeneity may represent a challenge for teachers. Therefore, it is important to sensitise teachers in this regard and to highlight the advantages of differentiated forms of teaching. Teachers' competences should therefore be developed in explicit teacher interventions in order to respond to this heterogeneity with appropriate differentiation measures. This applies not only to classroom teaching but also to the organisation of homework practice.

It is therefore important to sensitise teachers in this regard and to develop their skills in order to respond to this heterogeneity with appropriate differentiation measures.

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Appendix A

Table A1. Regression parameters.

Level	Paths	Est.	Beta	SE	z	*p*
1	HE→ SA	−0.278	−.214	0.073	−3.790	.000
1	GE→ SA	−0.237	−.227	0.065	−4.213	.000
1	PS→ SA	−0.157	−.133	0.066	−2.383	.017
1	HI→ SA	0.001	.023	0.002	0.398	.691
1	HE→ OP	0.096	.024	0.226	0.423	.672
1	SA→ OP	−0.610	−.200	0.178	−3.421	.001
1	GE→ OP	0.841	.229	0.201	4.192	.000
1	PS→ OP	0.502	.139	0.200	2.512	.012
1	HI→ OP	−0.002	−.019	0.005	−0.344	.731
1	indirect	0.170	.043	0.067	2.543	.011
1	total	0.265	.067	0.224	1.182	.237
2	HE→ SA	−0.374	−.498	0.258	−1.450	.147
2	HE→ OP	−0.378	−.311	0.862	−0.438	.661
2	SA→ OP	0.932	.575	1.400	0.665	.506
2	indirect	−0.348	−.286	0.567	−.613	.540
2	total	−0.726	−.598	0.633	−1.146	.252

HE = homework embedded in the teaching-learning process; SA = student anger; GE = gender; PS = parental support; HI = HISEI (Highest International Socio-Economic Index of Occupational Status of Parents); OP = orthography performance.

Table A2. Regression parameters.

Level	Paths	Est.	Beta	SE	z	*p*
1	DI→ SA	0.086	.069	0.072	1.194	.232
1	GE→ SA	−0.296	−.246	0.066	−4.487	.000
1	PS→ SA	−0.190	−.160	0.068	−2.796	.005
1	HI→ SA	0.001	.030	0.002	0.501	.616
1	DI→ OP	−0.110	−.029	0.213	−0.519	.604
1	SA→ OP	−0.624	−.205	0.174	−3.579	.000
1	GE→ OP	0.826	.226	0.201	4.119	.000
1	PS→ OP	0.460	.128	0.202	2.283	.022
1	HI→ OP	−0.002	−.023	0.005	−0.411	.681
1	indirect	−0.054	−.014	0.047	−1.132	.258
1	total	−0.164	−.043	0.216	−0.758	.448
2	DI→ SA	−0.168	−.130	0.585	−0.287	.774
2	DI→ OP	−1.641	−.779	1.282	−1.280	.200
2	SA→ OP	1.050	.645	1.084	0.969	.333
2	indirect	−0.177	−.084	0.597	−0.295	.768
2	total	−1.818	−.863	1.254	−1.450	.147

DI = Differentiation of homework; SA = students' anger; GE = gender; PS = parental support; HI = HISEI (Highest International Socio-Economic Index of Occupational Status of Parents); OP = orthography performance.