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ARTICLE

The importance of perceived quality of instruction, achievement motivation and difficulties in self-regulation for students who drop out of university

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Abstract

Background: Starting a study programme at an university, students are confronted with rising requirements regulating their learning processes and motivation. Both difficulties due to this regulation and the quality of instruction are associated with students dropping out from a study programme in the research.

Aims: The purpose of this research is to analyse the interplay and effect of difficulties in self-regulated learning, achievement motivation (i.e. academic self-concept, subject interest), and perceived quality of instruction in dropping out from an university study programme.

Sample: We sampled 2301 cooperative students in their first academic year. The average age was $M = 22.12$ ($SD = 3.02$), and 1167 were male (50.7%).

Method: This cross-sectional study used structural equation models for hypothesis analysis. Three years after the survey, dropout information from the university administration was matched to the survey data.

Results: The results indicate associations between academic self-concept, subject interest and difficulties in regulating one's motivation with dropout. An indirect effect was found between perceived quality of instruction and dropout via academic self-concept, subject interest and difficulties in regulating one's motivation.

Conclusions: The relevance of perceived quality of instruction, self-concept, subject interest and difficulties in motivational regulation and consequences for dropout is illustrated.

KEYWORDS

quality of instruction, self-regulated learning, university drop out, university freshman

Highlights

- Research shows that students' academic self-concept and subject interest were related to dropout.
- University dropout was associated with students' difficulties in regulating their motivation, but not in regulating their learning activities.
- Students' difficulties in regulating their motivation, academic self-concept and subject interest mediated the association of perceived quality of instruction and dropout.
- This research addresses the situation of first-year students who have to adapt to a new learning environment in higher education.

INTRODUCTION

Starting a study programme at university is linked to a variety of changes in university freshmen's achievement situations. Compared to secondary school, characteristics of the new learning environment have raised the requirements of self-regulated learning—which encompasses both regulating one's achievement motivation and one's learning activity—as well as less individual support by university teachers (Engelschalk et al., 2015; Pillay & Ngcobo, 2010; Schiefele et al., 2003). Empirical studies indicate that university freshmen can have problems adapting to this new learning environment and report difficulties in regulating their motivation for achievement (Dresel & Grassinger, 2013; Schnettler et al., 2020) or learning activities (Bäulke et al., 2018; Dresel et al., 2015; Peverly et al., 2003; van der Beek et al., 2020). These are defined as subjective problems in dealing with motivational respective learning behavioural requirements of learning or achievement situations. There is further evidence that difficulties in self-regulated learning are associated with students' dropout from university, defined as "situations where a student leaves the university study in which (s)he has enrolled before having obtained a formal degree" (Heublein, 2014; Kehm et al., 2019; Larsen et al., 2013, p. 5; Wild & Schulze Heuling, 2020). But less is known if both, difficulties with regulating one's motivation and with regulating one's learning activities—these regulation processes characterize self-regulated learning (Boekaerts, 1996; Cho & Heron, 2015; Hertel & Karlen, 2021)—are associated with dropping out from university.

Beyond difficulties in self-regulated learning, motivational attitudes such as students' academic self-concept and students' subject interest, are proven to be associated with students' dropping out from an university study programme (Dresel & Grassinger, 2013; Grassinger, 2018; Schnettler et al., 2020), which seems to be interwoven with students' self-regulated learning (Heublein et al., 2017; Schiefele et al., 2007). In other words, difficulties in regulating one's motivation and one's learning activities seem to be associated with students' achievement motivation, e.g. characterized by students' academic self-concept and students' subject interest. However, this interplay and its common relevance for students' dropping out of university study programmes have rarely been studied.

Finally, there is evidence that students tend to drop out of their study programme when the perceived quality of instruction is low (Georg, 2009; Schiefele et al., 2007). Low quality of instruction is associated with less achievement motivation and less self-regulated learning (Hernesniemi et al., 2020; Sogunro, 2017). Again, less is known about their interplay and their common relevance for dropping out of an university study programme.

To sum up, difficulties in self-regulated learning, maladaptive motivational attitudes (i.e. low students' academic self-concept, low students' subject interest), and low perceived quality of instruction are antecedents for students' dropout. The purpose of our study is to analyse the interplay of these antecedents. Hereby we focus on difficulties in regulating one's motivation and on difficulties in regulating one's learning activities—as two aspects of difficulties in self-regulated learning—differently to obtain a better understanding of the association of self-regulated learning and dropout.

Difficulties in self-regulated learning and its relevance for dropping out from an university study programme

Boekaerts (1996) argued that the regulation of learning can be differentiated into two processes—a cognitive respective behavioural one and a motivational one. The cognitive respective behavioural processes encompass learning activities, such as the choice of memory strategies (e.g. rehearsal, organization or elaboration). In other words, students must decide and know how to read texts in an effective manner, how to summarize a lecture or how to sustainably memorize learning content. Furthermore, students have to use metacognitive knowledge and skills to direct their learning, such as planning, time management, and the regulation of their engagement. For example, students must set learning goals, choose when, where and with whom to learn, or how to prepare for a test. Heublein (2014) reported empirical evidence that difficulties in regulating one's learning activities are associated with dropout. Furthermore, Creß and Friedrich (2000) reported for distance learning students, who elaborated on the learning matter in less detail, had a higher tendency to drop out. With a stronger focus on metacognitive strategies, Schiefele et al. (2007) indicate that problems in planning, time management, and regulation foster dropout from a study programme. With a focus on STEM study programs, Fleischer et al. (2019) found in a sample of university freshmen that students with less learning engagement reported a higher tendency to drop out.

In contrast, motivational regulation encompasses the creation of a learning intention, coping with stressors and negative emotions or dealing with obstacles. Self-instruction related to mastery goals or performance goals, fostering situational interest or rewarding oneself are examples of motivational regulation strategies (Schwinger et al., 2007; Wolters, 1999, 2003; Wolters & Benzon, 2013). There is evidence that difficulties in regulating one's motivation are also associated with dropout. For instance, Bäulke et al. (2018) analysed the interrelations between motivational regulation and dropout intentions, finding that in a sample of undergraduate students conditional knowledge about motivational regulation strategies predicts the effectiveness of motivational regulation, which in turn leads to lower dropout intentions. Furthermore, Schiefele et al. (2007) compared a sample of dropout students with matched regular students and found that dropout students reported more demotivation and less volition than their counterparts. Additionally, Dresel and Grassinger (2013), who questioned university freshmen, found that a decline in academic self-concept and subjective values, in addition to the expression of these variables, is associated with students' intention to terminate their studies or switch majors. In other words, less effective motivational regulation appears to be associated with dropping out.

Academic self-concept and subject interest and its relevance for dropout from an university study programme

Students' academic self-concept is defined as "mental representations of ones' abilities in academic domains" (Brunner et al., 2010, p. 964). It is a self-judgement of what skills and abilities one possess and has to be distinguished from, for example, self-efficacy, which is more characterized by the self-judgement of what one believes they can do with whatever skills and abilities they may possess (Bong & Skaalvik, 2003). We argue that students, who judge their skills and abilities with regard to their study programme as low, tend to experience action crisis, defined as "[…] a motivational conflict in which the individual is torn between holding on to and letting go of a personal goal" (Brandstätter & Bernecker, 2022, p. 286; Brandstätter & Schüler, 2013). In consequence, a low-ability self-concept on ones' study programme should be associated with an intention to drop out of this study programme. Furthermore "the psychological state of engaging or the predisposition to reengage with particular classes of objects, events, or ideas [of the subject, added by the authors] over time" is the definition of students' subject interest (Hidi & Renninger, 2006, p. 112). Again, we argue that students with less interest in their subjects within their study programme tend to experience action crises with the consequence of a higher intention to drop out of this study programme. Empirical evidence for both arguments is reported by Dresel and Grassinger (2013), Grassinger (2018), Bäulke et al. (2021), Benden and Lauermann (2022) or Schnettler et al. (2020). For instance, Schnettler

et al. (2020) questioned students of math and law three times during one semester and found that students' intrinsic value was negatively associated with students' intention to drop out (see also Grassinger, 2018). Dresel and Grassinger (2013) reported for first-year university students, who told a higher intention to drop out at the end of their first semester, that there exists a lower academic self-concept and lower motivational values at the beginning of their study programme. Benden and Lauermann (2022) present similar results for students in the first semester with a focus on math.

Instructional quality and dropping out

We characterized perceived instructional quality as the cognitive activation of students, a supportive climate in the interaction with students and classroom management (Fauth et al., 2014, 2020; Klieme et al., 2009). Researchers argued that a low instructional quality characterized, e.g., by a lecture with fewer activating elements or hardly supportive interactions with students, favours a higher intention to drop out of a study programme. Heublein (2014) give empirical evidence for this argument. He found that students who dropped out reported less clarity about the performance requirements, less organization of the studies and a lower teaching quality compared to students who continued their study programme. Additionally, Schiefele et al. (2007) indicated that students who quit their study programme perceive a lower instructional quality than their counterparts. In detail, students who dropped out judged lecturers' competence and engagement and the overall assessment of the lecture and seminars as lower. Furthermore, Neugebauer et al. (2019) argue that instructional quality is a significant factor in the study situation that predicts students dropping out. Blüthmann et al. (2011) present a study situation characterized by low instructional quality, low students support and care, an unattractive curriculum, and a rather unsuccessful organization of the study programme was highly associated with students' intention to drop out.

Interplay of difficulties in self-regulated learning, achievement motivation, and (perceived) instructional quality

Following supply-use models of teaching and learning (Brühwiler & Blatchford, 2011), quality of instruction is created as a supply from university teachers that may affect individual learning preconditions (i.e. achievement motivation) and individual learning processes (i.e. self-regulated learning), which in turn leads to learning outcomes (i.e. student achievement). Consistent with these assumptions, low quality instruction can lead to difficulties in self-regulated learning (Hernesniemi et al., 2020) and is negatively associated with learning and achievement motivation (Sogunro, 2017). For instance, excessive demands and workload within a seminar can be associated with problems in dealing with this requirement on a learning activity level. Alternatively, a lecture with less information on the utility of the learning content is correlated with less achievement motivation. We argue that both, difficulties in self-regulated learning and low achievement motivation (i.e. academic self-concept, subject interest), mediate the relationship between the quality of instruction and dropping out.

Furthermore, self-regulated learning and achievement motivation are associated (Hong et al., 2020; Trautner & Schwinger, 2020; Vanslambrouck et al., 2019). Vanslambrouck et al. (2019) identified three different profiles of self-regulated learners and found that high attainment and utility value were associated with the use of self-regulated learning strategies. To the best of our knowledge, there is little work on the relationship between difficulties in self-regulated learning and achievement motivation (i.e. academic self-concept, subject interest). Theoretically, there are different forms of relationship: (1) In her six-component model of self-regulated learning, Boekaerts (1996) argues that motivational beliefs (e.g. capacity respective ability beliefs, values related to tasks), which characterize achievement motivation sensu Eccles and Wigfield (2020), are associated with cognitive and motivational strategies (or difficulties hereby) in a manner (see also Zimmerman, 2000). In other words, achievement motivation and difficulties in self-regulated learning seem to be associated in that maladaptive motivational beliefs promote

the perception of difficulties in self-regulated learning (e.g. students who value the tasks perceive more difficulties in self-regulation) and vice versa (e.g. the perception of difficulties in self-regulation leads to less ability beliefs). This favours an interwoven model with no mediating effect of achievement motivation or difficulties in self-regulated learning in their association with dropping out. (2) Brandstätter and Schüler (2013) or Brandstätter et al. (2013) argue with reference to the Rubicon model of action phases that difficulties in self-regulated learning can be understood as action crises, which leads to reconsidering feasibility (cf. academic self-concept) and desirability (cf. subjective interest) of personal goals (Brandstätter et al., 2013; Brandstätter & Schüler, 2013). This argumentation favours motivation as a mediator model: difficulties in self-regulated learning are associated with achievement motivation, which in turn favours dropping out. (3) Finally, less achievement motivation can lead to less effort in self-regulated learning, which in turn can foster difficulties in self-regulated learning. The findings of McWhaw and Abrami (2001) support this idea. The authors reported that students; who are less motivated perceive more difficulties in self-regulated learning (McWhaw & Abrami, 2001). This argument favours difficulties in self-regulated learning as a mediator model: low achievement motivation is associated with difficulties in self-regulated learning, which in turn favours dropping out.

The present study

The purpose of our study is to analyse the interplay of self-regulated learning, achievement motivation, and quality of instruction with university students' dropout. Based on the idea of supply-use models of teaching and learning individual preconditions can be understood as proximal whereas instructional quality as more distal antecedent of dropout. So we assume that both, difficulties in regulating one's motivation and difficulties in regulating one's learning activities (H1a), and students' academic self-concept and subject values (H1b) are associated with dropping out from an university study programme. We further hypothesize that low (perceived) instructional quality is associated with students dropping out (H2a) and that there are indirect paths both from perceived instructional quality via students' achievement motivation (i.e. academic self-concept, and subject value) and difficulties in self-regulated learning to dropout (H2b).

Furthermore, we tested for a better understanding of the interplay of the mentioned proximal antecedents—students' achievement motivation and their difficulties in self-regulated learning and their common effect on dropping out. To be more precisely, three models were tested in an exploratory manner and we compared their model fits (Q1): (a) an interwoven model (there are correlations but no indirect paths of difficulties in self-regulated learning and of achievement motivation to drop out), (b) achievement-motivation-as-mediator-model (there are additionally indirect paths from difficulties in self-regulated learning via achievement motivation on dropping out) and (c) difficulties-in-self-regulated-learning-as-mediator-model (there are added to the interwoven-model indirect paths from achievement motivation via difficulties in self-regulated learning on dropping out).

METHODS

Participants and design

We used data from the first-panel wave of the study 'Study Process – Crossroads, Determinants of Success and Barriers While Studying at the Baden-Wuerttemberg Cooperative State University' (Deuer & Meyer, 2020) to test the hypotheses and analyse the research question. Members of the research group invited university students to take part in the study. Two emails were sent out with a link to an online questionnaire within a two-week interval. A privacy policy is heeded and participation is voluntary. Every 50th student who answered more than one question received an incentive worth 10 euros. The average age of the 2301 students in the sample was $M = 22.12$ years ($SD = 3.02$). Data from 1167 male (50.7%)

and 1134 female students (49.3%) were collected. A total of 38.3% of the survey participants had at least one parent with an university degree. Academic majors showed a distribution, that 58.4% of the students studied business administration, 33.3% were engineering students and 8.5% enrolled in social work. All students were cooperative students in the first academic year. Cooperative education combines the theoretical tuition of the university with the practical experience acquired at a company. Usually, every 3 months, the students switch between the theoretical and practical components of this programme (Wild & Alvarez, 2020).

Measures

Academic self-concept

An instrument by Dickhäuser et al. (2002) was used to measure the criterion-oriented reference norms of the academic self-concept. Participants rated themselves on a five-point Likert scale from one (strongly disagree) to five (strongly agree). Reliability of Omega (McDonald, 1999) with three items is acceptable (ω = .78; sample item: Against the background of the study programme exigencies, learning new things is easy/difficult for me).

Subject interest

The subject interest is measured with an instrument by Fellenberg and Hannover (2006). Reliability on three items by a 5-point Likert scale with values ranging from one (strongly disagree) to five (strongly agree) is seen as good (ω = .83; sample item: My field of study is just right for me).

Difficulties in regulating motivation and learning activities

Following Thiel et al. (2008), a five-point Likert scale with values ranging from one (strongly disagree) to five (strongly agree) was used to measure difficulties in regulation. Difficulties in *regulating one's motivation* were measured with two items (ω = .82; sample item: I have difficulty motivating myself to study). Difficulties in *regulating one's learning activities* were operationalized with three items (ω = .64; sample item: It is difficult for me to extract the key elements from a text).

Perceived quality of instruction

A shortened scale by Thiel et al. (2008) measures the perceived quality of instruction by three items that vary between one (strongly disagree) and five (strongly agree). Reliability shows good values (ω = .76; sample item: In general, the courses are well structured).

Dropout

Data from university administration were integrated with dropout information from approximately 3 years after the survey in the dataset (deadline: September 30, 2019). The dichotomous values for this variable are zero (= no dropout) and one (= dropout) in the data. In our sample, 171 respondents (7.4%) dropped out of their student program. It has to be mentioned that this rate is low compared to Heublein et al. (2022), who indicate approximately 25% dropout at universities of applied sciences. This low rate arises that maybe potential student dropouts tend to be less likely to participate in university surveys.

Data analyses and missing values

There exist relatively few missing values. Only the variable of the reported dropout from university administration had no missing values. Other variables had missing values between 5.7% and 12.1% ($M = 9.98$; $SD = 2.52$). A Missing Values Analysis indicates that Little's (1988) test of Missing Completely at Random (MCAR) was not significant, $\chi^2 = 31.11$, $df = 17$, $p = .27$. There was no evidence suggesting that the data were not MCAR (Peugh & Enders, 2004). As a consequence, we replaced the missing data with multiple imputations by chained equations of the R package 'mice' with 5 imputations (van Buuren & Groothuis-Oudshoorn, 2011).

The descriptive analyses and a *t-test* were conducted with SPSS (Version 27). The t-test was performed to test if the variables under consideration are relevant for dropout. Here, Hedges *g* was used to estimate the effects, because of adjusted for unequal sample sizes (Barton & Peat, 2014). Due to the dichotomous outcomes of dropping out, the estimator of diagonally weighted least squares (*DWLS*) was operated.

Structural equation models (SEM) were estimated with the package "lavaan" (Rosseel, 2012) of the software R to analyse the hypotheses and research question. To evaluate the model fit, a chi-squared test as an absolute fit index, the Tucker Lewis index (*TLI*) as a relative fit index that also adjusts for parsimony, the Root Mean Square Error of Approximation (*RMSEA*), the comparative fit index (*CFI*) and the Weighted Root Mean Square Residual (*WRMR*) were used (Hu & Bentler, 1999; Yu, 2002). Standardized parameters were reported in the estimation of the structural equation model. Mediation was tested by estimating bootstrapped conditional indirect effects (using 5000 replications) with non-standardized parameters that allow clear interpretability for such effects (Hayes, 2018). The null hypothesis of no indirect effect is rejected if the confidence interval did not include zero. In detail, we calculated three models and compared their model fit. In the first model, dropout was regressed on academic self-concept, subject values, difficulties in regulating one's motivation, and difficulties in regulating one's learning activities (interwoven model). In the second one, indirect paths from difficulties in regulating one's motivation and difficulties in regulating one's learning activities via academic self-concept and subject values were additionally tested (with achievement motivation as the mediator model). In a third model, indirect paths from academic self-concept and subject values via difficulties in regulating one's motivation and difficulties in regulating one's learning activities were tested (difficulties-in-self-regulated-learning-as-mediator-model). Finally, the perceived quality of instruction was added to the model with the best model fit. Hereby, academic self-concept, subject interest, difficulties in regulating one's motivation, difficulties in regulating one's learning activities, and dropout were regressed on the perceived quality of instruction (direct paths). Furthermore, indirect paths from the perceived quality of instruction via the variables of achievement motivation and both kinds of difficulties in self-regulated learning on dropout were tested.

RESULTS

Preliminary analysis

In the data, 171 respondents (7.4%) dropped out. First, we analysed whether the 4 scales of students' difficulties in self-regulated learning and students' achievement motivation (difficulties in regulating one's motivation, difficulties in regulating one's learning activities, academic self-concept, subject interest) could be separated. The measurement model was good ($\chi^2 = 346.997$, $df = 38$, $p < .001$; $CFI = .954$; $TLI = .934$; $RMSEA = .063$) and better than a two-factor-model (difficulties in self-regulated learning, achievement motivation; $\chi^2 = 2694.932$, $df = 43$, $p < .001$; $CFI = .588$; $TLI = .473$; $RMSEA = .178$) or a three-factor model (difficulties in self-regulated learning, academic self-concept, subject value; $\chi^2 = 1353.598$, $df = 41$, $p < .001$; $CFI = .805$; $TLI = .738$; $RMSEA = .125$). Table 1 shows descriptive statistics and correlations of all scales.

The *t*-tests showed significant differences for all considered antecedents of dropout. Middle effects exist for academic self-concept ($t(188) = 7.23$, $p < .001$, Hedges $g = .69$) and subject inter-

TABLE 1 Descriptive statistics and bivariate correlations of the scales ($N = 2301$).

	1.	2.	3.	4.	5.
1. Academic self-concept					
2. Subject interest	.28				
3. Difficulties in regulating one's learning activities	−.55	−.28			
4. Difficulties in regulating one's motivation	−.14	−.23	.24		
5. Perceived quality of instruction	.11	.20	−.16	−.06	
M	3.58	3.42	2.48	3.38	3.70
SD	.64	.82	.73	.99	.61

Note: All correlation coefficients are statistically significant at $p < .01$; r = correlation according to Pearson.

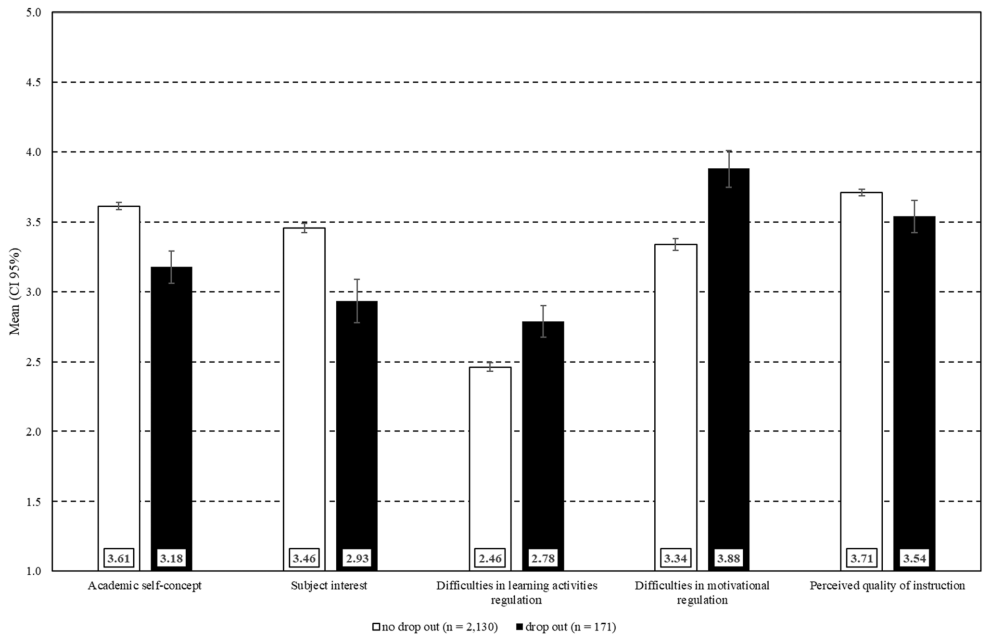

FIGURE 1 Comparing measurements between participants who dropped out and those who did not drop out ($N = 2301$). All means differ between dropped out and not dropped out students statistically significant at $p < .01$.

est ($t(185) = 6.42$, $p < .001$, Hedges $g = .65$) with lower values for participants who dropped out. In contrast, higher values with small effects existed for participants who dropped out due to difficulties in regulating their motivation ($t(207) = 7.68$, $p < .001$, Hedges $g = .55$) and in regulating their learning activities ($t(2299) = 5.63$, $p < .001$, Hedges $g = .45$). Perceived quality of instruction is lower for dropping-out participants with a small effect ($t(186) = 2.82$, $p < .01$, Hedges $g = .28$). Figure 1 visualizes the results.

Results of the hypotheses and the research question

Table 2 shows the model fits of the three models in consideration—the interwoven model, the achievement-motivation-as-mediator model, and the difficulties-in-self-regulated-learning-as-mediator-model. The chi-square difference test revealed that the interwoven-model had the best model fit ($\Delta\chi^2 \geq 74.16$, $\Delta df = 4$, $p < .001$) (Q1).

TABLE 2 Model fits of the different models considered.

Model	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*WRMR*
Interwoven-model	283.37	77	.984	.978	.034	1.454
Achievement-motivation-as-mediator-model	523.28	81	.965	.954	.049	1.976
Difficulties-in-self-regulated-learning-as mediator model	357.53	81	.978	.971	.039	1.633

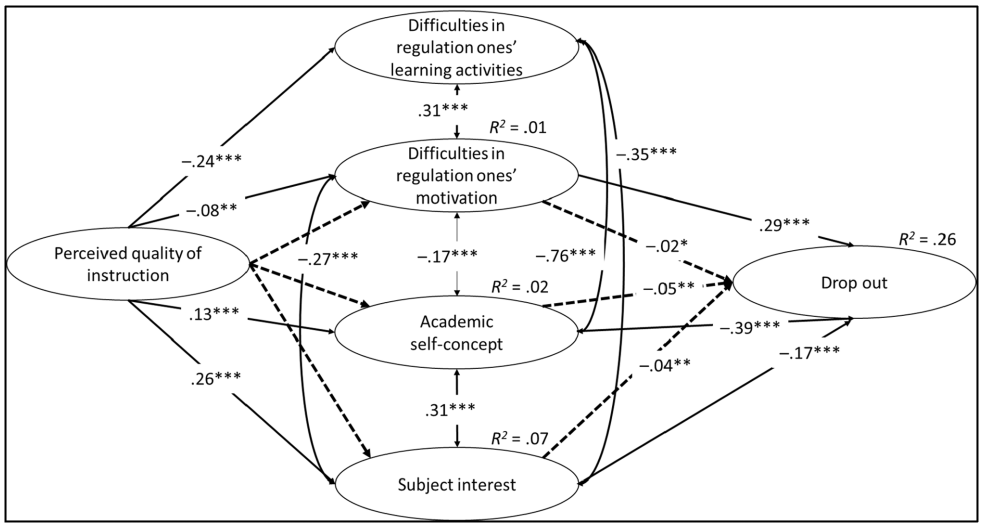

FIGURE 2 Results on the interplay of quality of instruction, difficulties in regulating both motivation and learning activities, academic self-concept, and subject value and their common effect on dropouts. The figure shows statistically significant standardized parameters.

In Figure 2, the interwoven model with all significant correlations and paths is presented. We found that difficulties in regulating one's learning activities and in regulating one's achievement motivation were moderately correlated with each other, and both kinds of difficulties in self-regulated learning were moderately associated with academic self-concept and subject interest. Only the correlation between difficulties in regulating one's learning activities and students' academic self-concept was high ($r = -.76$, $p < .001$). With regard to their common effect on dropout, the results revealed that students with more difficulties in regulating their motivation, less academic self-concept and low intrinsic motivation dropped out with a higher probability. There was no direct effect of difficulties in regulating one's learning activities on dropout ($\beta = -.17$, $p = .105$) (H1).

Students who perceived low instructional quality reported more difficulties in self-regulated learning—both in regulating one's learning activity and one's motivation—and less academic self-concept and less subject interest. Finally, there existed indirect paths from perceived instructional quality via (i) difficulties in regulating one's motivation ($b = -.04$; 95% CI = [−.07; −.01]), (ii) students' academic self-concept ($b = -.09$; 95% CI = [−.16; −.03]) and (iii) students' subject interest ($b = -.08$; 95% CI = [−.13; −.03]) to dropout (H2b). In other words, a low perceived quality of instruction indirectly promoted students' dropout. The direct path from the perceived quality of instruction to dropout was not significant ($\beta = -.06$, $p = .232$) (H2a). For the indirect paths, non-standardized parameters are reported here. For standardized ones, see Figure 2.

GENERAL DISCUSSION

Previous work has indicated that students with more difficulties in self-regulated learning (Creß & Friedrich, 2000; Fleischer et al., 2019; Heublein, 2014; Schiefele et al., 2007), with low achievement moti-

vation (Dresel & Grassinger, 2013; Grassinger, 2018; Schnettler et al., 2020), and low perceived instructional quality (Blüthmann et al., 2011; Heublein, 2014; Neugebauer et al., 2019; Schiefele et al., 2007) tend to drop out of their study programme. The purpose of this work was to analyse the interplay of these variables and their relevance for dropping out. Hereby we focussed on difficulties in regulating one's motivation and on difficulties in regulating one's learning activities differently to find evidence of whether both processes are relevant for dropping out.

The results of the SEM confirmed that both kinds of difficulties in self-regulated learning have to be separated and that students' difficulties in regulating their motivation were associated with dropping out, but not students' difficulties in regulating their learning activities. Furthermore, we found that students with less academic self-concept and with less subject interest dropped out with a higher probability. These findings are consistent with former work on the associations of achievement motivation and dropping out (Dresel & Grassinger, 2013; Grassinger, 2018; Schnettler et al., 2020), which focused on students' intention to drop out and not on the realization of dropping out. This is remarkable, because the prognostic validity of an intention to drop out is acceptable, but not always the best (Deuer & Wild, 2019). However, our findings support the relevance of motivational variables for dropping out. This gives evidence to Schnettler et al. (2020), who argue that dropping out can be understood primarily as a motivational decision process. Bäulke et al. (2021) argue that this kind of motivational decision process encompasses five phases, named (a) non-fit perception, (b) thoughts of quitting, (c) deliberation, (d) information search and (e) the final decision, and empirical evidence was found for this assumption. Additionally, the results showed that models with (i) indirect paths from achievement motivation via difficulties in self-regulated learning on dropping out or (ii) from such kinds of difficulties via achievement motivation on dropping out had a significantly worse model fit than the interwoven model. This gives evidence that difficulties in regulating one's motivation and students' achievement motivation (i.e., academic self-concept, student interest) are directly related to dropping out.

Furthermore, the findings indicate that the relationship between students' perceived quality of instruction with dropping out is mediated by students' achievement motivation and difficulties in regulating their achievement motivation. There was no direct effect of perceived quality of instruction on dropping out. In other words, a high perceived quality of instruction can have the power to reduce dropouts from a study programme, especially when students' academic self-concept, their subject interest and their regulation of motivational problems are supported. For example, subject interest can be promoted by addressing the intrinsic value (e.g. using humour related to course content; Bieg et al., 2018) or using utility-value intervention (Hulleman et al., 2010). However, the explained variance in dropping out of approximately 25% also indicates that there are further variables that affect dropping out, e.g. academic performance (Chen, 2012; Voelkle & Sander, 2008). Overall, dropout seems to be affected by different factors (Heublein et al., 2017). This research leads to a better understanding of their interplay in understanding dropout. More work with longitudinal data is needed to replicate the findings on the process by which quality of instruction can lead to less dropout by promoting students' academic self-concept, subject interest and regulation of motivational problems. Additionally, for a better understanding of dropouts, further antecedents and their interplay with achievement motivation and self-regulation should be mentioned, so that more variance in dropouts can be explained. Furthermore, there are an increasing number of arguments that achievement motivation (Dietrich et al., 2022; Moeller et al., 2022) and self-regulation (Cleary & Callan, 2018) should be conceptualized (and measured) more situationally. Considering in further work intraindividual variance in motivation, self-regulation and in the perception of quality of instruction, beyond interindividual variance, can promote a deeper understanding of the interplay of these variables.

Limitation

Restrictively, the measurement of difficulties in regulating one's learning activities showed low reliability ($\omega = .64$). Furthermore, difficulties in regulating one's motivation can be expectancy-related

or value-related (Engelschalk et al., 2015). For example, students must regulate self-doubt on one's abilities and competences and/or uninteresting teaching and learning content. The first evidence that both difficulties are critical for dropout comes from Grassinger (2018), who found that unfulfilled expectations for success and unfulfilled study values, which can be understood as difficulties in motivational regulation, favour the intention to drop out in addition to students' current motivation. In this work, difficulties in regulating one's motivation were measured with two items that hardly represent the different aspects of difficulties in regulating one's motivation. For a better understanding of the relevance of difficulties in regulation, one's motivation for dropping out due to expectancy-related and value-related difficulties should be considered in future work. Again, with respect to the measurement, the broad conceptualization of perceived instructional quality encompassing cognitive activation, supportive climate, and classroom management was measured with items used for students' evaluations of university teaching. Marsh et al. (2009) reported positive correlations of this kind of measurement with cognitive activation and a supportive climate, which is evidence of the validity of this measurement.

In an exploratory manner, three models were compared—referred to as the interwoven model, achievement-motivation-as-mediator-model, and difficulties-in-self-regulated-learning-model—to obtain evidence on the interplay of students' achievement motivation and their perceived difficulties in self-regulated learning and drop out. The findings should be interpreted carefully because of the cross-sectional nature of our data. For example, we treated in our analyses dropout as an outcome variable, because we refer to literature on the dropout and its antecedents. But it may also be that individual attributions of dropout lead to less achievement motivation, the perception of difficulties in self-regulated learning or low perceived quality of instruction. As a consequence, more evidence on the interplay of achievement motivation and difficulties in self-regulation, and its effect on dropout longitudinal mediation models are needed (O'Laughlin et al., 2018).

Furthermore, this work focuses on subject interest as value-related motivational concept. The situated expectancy-value theory of learning and achievement motivation postulates that there are different components of task values, namely intrinsic value, attainment value, utility value, and cost (Wigfield et al., 2017; Wigfield & Eccles, 2000), which represent different kinds of task value (Gaspard et al., 2018; Gorges, 2017). Beyond that, there is evidence that both, expectancy-related and value-related motivational variables change within university freshmen, which is associated with dropping out (Dresel & Grassinger, 2013). Further work is needed for a better understanding of the relevance of different kinds of task values and of different trajectories of students' motivation for dropping out.

Furthermore, we used collected data from cooperative students from only one German university in one federal state, which has a special academic system, and students are selected by companies (Wild & Neef, 2019; Kupfer, 2013). This may limit the generalization of the findings. Our study was realized as a cross-sectional study. Consequently, the relations are in a correlated manner. For a better understanding of the process of the interplay of difficulties in self-regulated learning, achievement motivation, and instructional quality, a study design is needed, which better reflects the longitudinal process (Allison, 2009).

A strength of our study is that we integrate actual dropouts 3 years after the survey based on data from the university administration. In addition, the sample size has over 2000 participants. As a consequence, a high power of analyses can be assumed.

CONCLUSION

Taken together, achievement motivation (i.e., academic self-concept, subject value) and difficulties in regulating one's motivation were directly related to realized dropouts. Less perceived instructional quality was indirectly associated with dropouts via the mentioned variables. Consequently, instruction that supports students' achievement motivation and students' regulation of their motivation seems to have the power to reduce dropouts.

AUTHOR CONTRIBUTIONS

Steffen Wild: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; software; validation; visualization; writing – original draft; writing – review and editing. **Robert Grassinger:** Conceptualization; methodology; resources; supervision; validation; visualization; writing – original draft; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors of this study declare that he has no biomedical or financial conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

Data are available. Please contact the corresponding author.

CODE AVAILABILITY

Syntax is available. Please contact the corresponding author.

ETHICAL STATEMENT

The study was conducted in accordance with the Declaration of Helsinki. It was approved by Baden-Wuerttemberg Cooperative State University (8th July 2015) and local heads of the research groups for ethical standards. All the participants gave their digital informed consent.

CONSENT TO PARTICIPATE

Before the participants responded, informed consent was obtained and the anonymity of responses was ensured.

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