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Does metacognitive knowledge mediate the relation between goal orientations and educational achievement in secondary school students?

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Abstract

Introduction. Student's metacognitive knowledge as well as their goal orientations are related to educational achievement. Metacognitive knowledge enables the learner to choose learning strategies in such a way that they are situation-appropriate as well as efficient. It develops in conjunction with domain-related learning activities, which in turn are influenced by students' goal orientations. This leads to the assumption that goal orientations differentially influence the development of metacognitive knowledge, and that the latter mediates the effect of goal orientations on educational achievement.

Method. Respective hypotheses were tested using data from a longitudinal study with 928 German secondary school students in which goal orientations were assessed in grade five and metacognitive knowledge and educational achievement in the domains of reading and English as a foreign language (EFL) were repeatedly tested from grade five to seven.

Results. Findings indicate that learning goal orientation had a positive impact on metacognitive knowledge and on achievement in reading, which was mediated by metacognitive knowledge. The opposite was found for performance goal orientation, which focuses on the demonstration of competence and the intention to outperform others.

Conclusion. Learning goal orientation not only affects achievement directly but also indirectly through a positive effect on metacognitive knowledge. Performance orientation does not have a positive effect on the relation between metacognitive knowledge and performance.

Keywords: metacognition, metacognitive knowledge, goal orientation; achievement.

Resumen

Introducción. El conocimiento metacognitivo del alumno, así como sus orientaciones de objetivos, están relacionados con el rendimiento académico. El conocimiento metacognitivo permite al alumno elegir estrategias de aprendizaje de tal manera que sean apropiadas a la situación y también eficientes. Se desarrolla junto con actividades de aprendizaje relacionadas con el dominio, que a su vez están influenciadas por las orientaciones de los objetivos de los estudiantes. Esto lleva a la suposición de que las orientaciones de los objetivos influyen de manera diferente en el desarrollo del conocimiento metacognitivo, y que este último media el efecto de las orientaciones de objetivos en el logro educativo.

Método. Las hipótesis respectivas se probaron usando datos de un estudio longitudinal con 928 estudiantes de escuelas secundarias alemanas en los que se evaluaron las orientaciones de objetivos en quinto grado y el conocimiento metacognitivo y el rendimiento educativo en los dominios de lectura e inglés como lengua extranjera (EFL) cinco a siete.

Resultados. Los resultados indican que la orientación de los objetivos de aprendizaje tuvo un impacto positivo en el conocimiento metacognitivo y en los logros en la lectura, que fue mediado por el conocimiento metacognitivo. Se encontró lo contrario para la orientación de los objetivos de rendimiento, que se centra en la demostración de competencia y la intención de superar a los demás.

Conclusión. La orientación de los objetivos de aprendizaje no solo afecta los logros directamente sino también indirectamente a través de un efecto positivo en el conocimiento metacognitivo. La orientación al rendimiento no tiene un efecto positivo en la relación entre el conocimiento metacognitivo y el rendimiento.

Palabras clave: metacognición, conocimiento metacognitivo, orientación a los objetivos; logro

Introduction

For learning to be effective, learners need to take an active role in regulating their activities. Motivational as well as metacognitive variables are central for active self-regulated learning (e.g. Pintrich & Zusho, 2002; Winne, 1996). One requirement for self-regulation is the goal setting and goal striving of learners (e.g. McWhaw & Abrami, 2001; Wirth, Künsting, & Leutner, 2009). The importance of motivational variables such as goal orientation in the context of self-regulated learning has been demonstrated in several studies (e.g. Bernacki, Byrnes, & Cromley, 2012; Coutinho & Neuman, 2008; Diseth, 2011; Pintrich, 2000b; Steinmayr, Bipp, & Spinath, 2011). Similarly, it has been shown that metacognitive variables are highly relevant in self-regulated learning as they support strategy application, monitoring and regulation of learning activities (Efklides, 2008; Winne, 1996). However, so far only a few studies investigated the relation between aspects of metacognition and goal orientations for learning (Roebers, Krebs, & Roderer, 2014). To our knowledge, there are no studies explicitly focusing on the relation between the metacognitive knowledge dimension of metacognition and students' goal orientation. Given that metacognitive knowledge and goal orientation (as well as their interrelation) will be the focus of the present study, the state-of-the-art of research concerning these constructs will be briefly summarized.

Metacognitive knowledge

Metacognition typically encompasses at least two different dimensions –a (declarative) knowledge dimension and a procedural dimension (Schneider & Lockl, 2002). The procedural dimension is further divided into monitoring and control processes (Nelson & Narens, 1990). Usually, tasks assessing procedural metacognition include both aspects and focus on metacognitive regulation through the processes of metacognitive monitoring and control (Schneider & Lockl, 2008).

The declarative metacognitive knowledge component covers knowledge regarding one's own learning from various perspectives. It includes knowledge regarding the demands of a learning task (task knowledge), knowledge regarding the importance of individual difference variables such as age or intelligence (person knowledge), and knowledge regarding the utility of learning strategies (strategy knowledge; see Flavell, 1971). Moreover, declarative metacognitive knowledge also includes knowledge about the situational requirements for the appropriate and effective use of a specific learning strategy (conditional

knowledge). This knowledge component serves to decide "when", respectively in which situations, a certain strategy may be applied successfully (Paris, Lipson, & Wixson, 1983). Finally, an important component of metacognitive knowledge concerns relational strategy knowledge, that is, knowledge related to the relative effectiveness of a strategy in comparison to other strategies within a given learning situation (Borkowski & Turner, 1990). Consequently, relational metacognitive knowledge enables a learner to choose situation- and task-appropriate strategies. According to the "good strategy user model" (Pressley, Borkowski, & Schneider, 1987), relational strategy knowledge represents an abstract, higher-order knowledge category concerning learning strategies. It develops by repeatedly using specific strategies across various learning tasks.

Numerous studies have shown that declarative metacognitive knowledge is an important predictor of children's learning (Kreutzer, Leonard, & Flavell, 1975; for reviews, see Efklides, 2008; Schneider 2015). Recent empirical findings on the relation between metacognitive knowledge and academic achievement remain to underpin its relevance for learning and performance (Artelt, Naumann, & Schneider, 2010; Neuenhaus, Artelt, Lingel, & Schneider, 2011). When investigating the relation between metacognitive knowledge and achievement, it has to be considered that metacognitive knowledge is most likely to increase performance if learning tasks are of medium difficulty for the individual learner (Weinert, 1984). If tasks are too difficult to be solved, the application of strategies is not effective, and simple tasks are easily solved without strategies. Therefore, demanding learning tasks provide the best opportunity to apply strategies in order to increase performance and enable the strategy related experiences which are essential for the development of metacognitive knowledge (for review see: Schneider, 2010; Schneider & Lockl, 2002).

Goal orientations

Goal orientations explain why students pursue a learning task the way they do, and also cover individual reasons for learning. They range from a desire to engage in certain learning activities with little consideration of performance outcomes (learning orientation) to the mere execution of learning activities in order to outperform others or to appear smart (performance orientation). Task or learning engagement based on individual interest is highly driven by intrinsic motivation. The execution of learning activities as a mean to receive high performance evaluations is mainly driven by a desire to approach success (Elliot, 2006).

In early research on goal orientation, learning orientation and performance orientation were regarded as two poles of a continuum (Dweck, 1986). Recent models of goal orientation build on the assumption that learning goal orientation incorporates a desire to acquire knowledge and skills. For performance goal orientation, these models distinguish between valence aspects of the concept by separating approach goal orientation and avoidance goal orientation (Elliot & Church, 1997; Murayama, Elliot, & Yamagata, 2011). This revision of goal theory has been discussed controversially especially with respect to the impact of learning and performance orientation on performance and attitudes towards learning. Theorists taking on a multiple goal perspective argue for the need to separate performance avoidance and performance approach goals as they claim that the latter can be beneficial for learning at least in conjunction with a learning orientation (Dela Rosa & Bernardo, 2013; Harackiewicz, Barron, Pintrich, Elliot, & Trash, 2002; Pintrich, 2000a). Scientists favoring a learning goal perspective acknowledge that performance approach goals might be beneficial under particular circumstances, but emphasize the extensive benefits of a learning goal orientation (Midgley, Kaplan, & Middleton, 2001).

The empirical relation between different types of goal orientation and performance has been well established. Findings on the relation between learning orientation and achievement altogether show a positive relation, indicating that a learning orientation usually increases performance, whereas performance orientations are less beneficial (Linnenbrink, 2005; Steinmayr, et al., 2011). Findings on the relation between performance orientation and academic achievement are less consistent (Wigfield & Cambria, 2010). Some studies indicate that *approach* performance orientation may be beneficial for achievement under certain circumstances, for instance, when the complexity of learning requirements is low (Midgley, et al., 2001), when the goal self-concordance is high (Gaudreau, 2012) or when assumptions about the importance of study materials are accurate (Senko, Hama, & Belmonte, 2013). Approach performance orientation is also positively related to persistence and expansion of effort, which again constitute relevant aspects of successful learning.

Findings concerning *avoidance* performance orientation and achievement clearly indicate a disadvantage of this type of goal orientation (Schwinger & Stiensmeier-Pelster, 2011). Students who are highly concerned about their performance, trying to avoid failure or to prevent themselves from appearing stupid typically show low performance and negative achievement-related emotions (Pekrun, Elliot, & Maier, 2006). Furthermore, they mainly

engage in surface level information processing (Tuominen-Soini, Salmela-Aro, & Niemivirta, 2012) and maladaptive learning behaviors which affects learning experiences and outcomes in a negative way (Midgley & Urdan, 2001). Therefore their investigation is omitted in the present paper.

The relation between metacognitive knowledge and goal orientation

Although recent findings on the procedural aspects of metacognition provide some evidence for the independence between performance goal orientation and metacognitive monitoring and control (Roebers, et al., 2014), closer relationships between metacognitive knowledge development and learning goal orientation seem likely in the case of challenging learning material, that is, in situations where students benefit from task-appropriate strategies. Here, the application of learning strategies not only improves performance but also provides the experience necessary to develop strategy-related metacognitive knowledge. The frequent and repeated application of varying strategies across different tasks and learning contexts is accompanied by experiences of their relative effectiveness. The experience of a strategy's effectiveness under various circumstances and in comparison to other available strategies, again, is essential for the development of relational metacognitive knowledge (Borkowski, Chan, & Muthukrishna, 2000).

Goal orientations have an impact on learning-related behaviors (Elliot, McGregor, & Gable, 1999; Midgley, et al., 2001), strategy use (Coutinho & Neuman, 2008; Elliot, et al., 1999; Pintrich, 2000b), and learning-related experiences such as emotions (Pekrun, et al., 2006) and students well-being (Kaplan & Maehr, 1999; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008; Tuominen-Soini, et al., 2012). In such they affect learning-related experiences which are necessary for the development of metacognitive knowledge.

Foremost, the positive relation between learning orientation and learning-related behaviors indicates a relevant pathway not only for performance improvements but also for the development of metacognitive knowledge. Students with a strong learning orientation typically show more self-regulated learning behaviors (Bernacki, et al., 2012; Diseth, 2011), increased use of deep-level strategies (Coutinho & Neuman, 2008; Elliot, et al., 1999; Pintrich, 2000b), longer persistence on a task, and higher levels of information processing and effort (Elliot, et al., 1999). Furthermore, they prefer challenging tasks (Ames & Archer, 1988) and appear to benefit most when learning tasks are more demanding or complex (Utman,

1997). From a motivational perspective, learning orientation is related to higher self-efficacy-beliefs, positive emotions, and interest (Linnenbrink, 2005). Accordingly, learning orientation positively affects learning related processes which are highly relevant for metacognitive knowledge to develop. Performance orientation on the contrary is usually related to rather superficial processing, the application of surface-level strategies or even a lack of strategy use (Bernacki, et al., 2012; Coutinho & Neuman, 2008; Elliot, et al., 1999). In such, it limits the opportunities to experience the benefit and pleasure of learning engagement and strategy application which are necessary for the development of metacognitive knowledge.

Overall, however, the evidence regarding relationships between goal orientation and metacognitive knowledge is scarce. In particular, little is known about indirect effects of goal orientations on the development of metacognitive knowledge, mediated through the impact of goal orientations on application and successful usage of learning strategies. Given that learning orientation has been shown to be especially beneficial for more complex learning processes, and that it is related to deeper processing and superior strategy usage, this orientation component should provide various opportunities for the development of metacognitive knowledge. On the other hand, there is reason to assume that performance orientation should be negatively related to the development of metacognitive knowledge.

Aim of the study

The present study was conducted to investigate the impact of goal orientation on the development of metacognitive knowledge, and to take a closer look at their indirect effects on academic achievement. In a first step, we aimed at replicating findings regarding the relation between goal orientation and academic achievement in two subject domains – reading and English as a foreign language - that differ in their degree of complexity for learning. In the second step, we examined the relation between goal orientation and metacognitive knowledge in these two academic domains and aimed at providing evidence for the mediating effect of metacognitive knowledge.

As pointed out earlier, learning orientations are beneficial for learning and achievement, especially when learning tasks are complex. In our study, we therefore assessed achievement in two domains in which learning tasks, as well as the performance tests applied, differed in their degree of novelty and complexity. We assessed achievement in the domain of reading, where students already had seven-year-experience of formal instruction, and we

assessed achievement in the domain of English as a foreign language (EFL), where students had only about two years of schooling. Taking the students' experience in reading into account, the tests for reading comprehension consisted of demanding texts and complex reading tasks. Due to the complexity of the tasks, we expected to find a positive relation between learning orientation and reading achievement. In the domain of EFL, students had little experience with complex tasks and the performance test we applied contained rather basic tasks of language comprehension which referred to rote learning of vocabulary and elementary grammar knowledge essential in the beginning of second language learning. . Given that a certain account of task complexity is required for learning orientation to affect achievement level, we assumed that in the domain of EFL no relation should be found between students' learning orientation and their achievement at this early stage of (foreign) language acquisition.

With respect to the development of metacognitive knowledge and its relation to goal orientation, we expected to find an even stronger effect of domain complexity on learning outcomes, mainly because students with a strong learning orientation should invest more effort in demanding learning activities. As noted above, deep-level learning and strategy use are beneficial for the development of metacognitive knowledge. In reading, students are already challenged to optimize their learning, leading to the hypothesis that learning orientation positively predicts metacognitive knowledge in reading. The situation is different for EFL because at the early stage, this domain provides little opportunity to engage in complex learning tasks. Here, it seems sufficient to apply surface level strategies such as memorization. Thus our *first hypothesis* was:

1) Learning orientation positively predicts achievement and metacognitive knowledge in the familiar domain of reading, and to a lesser extent in the new domain of EFL. When regarding the impact of goal orientation on achievement and on the development of metacognitive knowledge, the relation between achievement and metacognitive knowledge has to be considered. Based on the general assumption that metacognitive knowledge is a necessary prerequisite for achievement, and that learning goal orientation affects the acquisition of metacognitive knowledge, we assumed that learning goal orientation predicts achievement in reading and also supports the development of metacognitive knowledge in this domain. In addition, metacognitive knowledge itself should be positively related to achievement. Thus our expectation was that metacognitive knowledge serves as a mediator

between learning orientation and achievement. This assumption leads to the *second hypothesis*:

2) Learning orientation exerts an indirect positive effect on achievement in reading mediated through metacognitive knowledge in this domain. As noted above, empirical findings on the relation between performance orientation and achievement are less clear. For complex tasks, performance orientation is usually negatively related to achievement while it is sometimes positively related to achievement if the tasks are simple. Students with strong performance orientation are concerned with performing well. They put strong emphasis on getting high achievement scores and expend most effort to optimize their immediate learning output and little to the improvement of their learning processes or strategy usage. In line with findings on the disadvantage of performance orientation for learning behavior and strategy usage, we assume a negative impact of performance orientation on achievement and metacognitive knowledge for both domains. Even though some short-term benefits of performance orientation on achievement have been found, we assume that, in the long run, motivation to outperform others and to appear smart should be of disadvantage. Thus we assume that the development of metacognitive knowledge in performance-orientated students should be limited due to their neglect of deep-level learning processes and activities. Overall, such a performance orientation should impede the development of metacognitive knowledge. This lead to our *third hypothesis*:

3) Performance orientation does not show positive effects on achievement and metacognition related to reading and EFL. Because performance orientation is expected to predict achievement as well as metacognitive knowledge in a negative way, and because metacognitive knowledge is considered to be an important resource for improvement of achievement, we assume to find an indirect negative effect of performance orientation on achievement mediated by metacognitive knowledge. Our *last hypothesis* was:

4) Performance orientation exerts an indirect negative effect on achievement mediated through the negative effect it has on metacognitive knowledge.

Method

Participants

Altogether, students from 44 classrooms and 24 schools in Bavaria (Germany), participated in the longitudinal study. The assessment started at the beginning of fifth grade. The full sample consisted of 928 students and was balanced regarding gender, with 451 participants being female and 477 being male. On average, students were about 10 years and 11 months of age at the beginning of the study. The participating schools were stratified by the educational track of the school. That is, altogether 271 participating students attended schools from a high (academic) track, another 377 students attended school from the intermediate track, and 280 students came from lower-track schools.

Instruments

Metacognitive knowledge. Metacognitive knowledge was assessed with domain related instruments, one focusing on the domain of reading and the second one on the domain of English as a foreign language (EFL). Both tests applied a scenario-based testing procedure and consisted of five metacognitive knowledge tasks for each domain. Each of the tasks starts with a description of a domain-typical learning situation that was called a "scenario". For all scenarios, a list of five to six strategies was presented that varied in their effectiveness to deal with the described situation. Students were asked to judge the effectiveness of the strategies on a six-point Likert scale (1 = very good strategy, 2 = good, 3 = satisfying, 4 = sufficient, 5 = insufficient, 6 = inadequate) which corresponds to the German grade system. When students considered two (or more) strategies as equally appropriate (or inappropriate) for coping with the learning scenario, they were allowed to give the same grade twice or even several times. An example task is shown in Figure 1.

Scenario: You have to learn information regarding London from a short English text. How are you going to proceed to learn as much information as possible? Give a score to each of the following strategies!

		Grade					
		1	2	3	4	5	6
A	I highlight the most relevant parts while reading the text. Afterwards, I look through these parts again.						
B	I read the text sentence by sentence and try to memorize all.						

C	I skim the text to find the most important parts.						
D	I write down the most important information and afterwards reread these notes.						
E	I highlight the most relevant parts while reading the text. Then, I sort them into categories and write them down.						

Figure 1. Example task of the metacognitive knowledge test in EFL.

For the domain of reading, the metacognitive knowledge tasks were partly adapted from the PISA 2003 and 2009 assessments (Artelt, et al., 2010; OECD, 2005, 2007). For the domain of EFL, the test was developed by the first author (Neuenhaus, 2011; Neuenhaus, Artelt, & Schneider, 2017). To evaluate students' performance, their responses were recoded to dichotomous response categories based on expert ratings of the provided strategies (Neuenhaus, et al., 2017). Students received a score of one if their judgment on a strategy pair was in line with the experts' ratings. When their judgment was contrary to the expert ratings or whenever they considered the two strategies of a pair as equal, they received a score of zero. In other words: if experts agreed that a strategy was superior to another strategy, students had to come to the same conclusion in order to get credit. Pilot studies carried out with 399 fifth- and sixth-grade students in the domain of reading and with 393 fifth- and sixth-grade students in the domain of EFL supported the reliability and criterion validity of the metacognitive knowledge test (Lingel, Neuenhaus, Artelt, & Schneider, 2010). In the present study, the internal consistency (Cronbach's Alpha) of the metacognitive knowledge test in reading was $\alpha = .82$ in sixth grade and $\alpha = .82$ in seventh grade. The reliability of the metacognitive knowledge test in EFL was $\alpha = .74$ in sixth grade and $\alpha = .78$ in seventh grade.

Goal orientation. Learning orientation and approach performance orientation were assessed with items drawn from the SELLMO (Spinath & Schöne, 2003) – a well-established, reliable and widely used standardized German test of goal orientation. The internal consistency of the four items selected to assess learning orientation was $\alpha = .79$, and the internal consistency of the two items used to assess approach performance orientation was $\alpha = .68$. Items for performance orientation were: In terms of school, my objectives are (1) that others think I am smart and (2) that others realize that I do well in tests and examinations. Items for learning orientation were: In terms of school, my objectives are (1) to become able to solve tricky problems, (2) to understand complicated matters, (3) that the stuff I learned makes sense and (4) to gain a deep understanding of the topics.

Achievement in reading. To assess achievement in reading, a multiple-choice reading test was used to cover the complex demands of text comprehension (Pfost, Dörfler, & Artelt, 2013). The test was constructed in line with its quality for vertical scaling and also examined regarding its age appropriateness. At each measurement occasion, the test comprised three different texts containing between 225 and 455 words each. The texts were accompanied by seven to twelve multiple choice items assessing the different levels of comprehension. A total of 28 items were administered in grade six, and another 22 items in grade seven. It took students about 20 minutes to complete the task. To assess changes in reading achievement across time, the items of both measurement occasions were vertically scaled using a unidimensional Rasch-Model based on anchor items which were applied repeatedly (Young, 2006). The internal consistency of the reading test was $\alpha = .75$ ($r_{EAP} = .73$) in grade six and $\alpha = .81$ ($r_{EAP} = .77$) in grade seven.

Achievement in EFL. Students' achievement in EFL was assessed using a self-developed English version of a stumble-word speed test. The test assesses basic reading comprehension in EFL and comprised 35 items. Each item consisted of one sentence containing a word which did not belong there – the stumble word (underlined in the following examples of sentences from the stumble word test: Examples: On Friday warm afternoon Charlie plays football; The grass in the garden is green nice). Under time restriction, students were asked to correct as many sentences as possible. The test was applied repeatedly. In sixth grade, the students were given three minutes time for crossing out the stumble words of all 35 sentences. In seventh grade, the test time was reduced to two minutes. For longitudinal analysis, the amount of correct responses per minute was used as an indicator for achievement. The parallel-test reliability was $r_{tt} = .92$ in sixth grade and $r_{tt} = .91$ in seventh grade. The test was highly correlated with a close test measure for EFL applied in seventh grade ($r = .60$, $p < .001$), and with self-reported grades in EFL by the end of grade six ($r = -.43$; $p < .001$).

Procedure

During the course of the longitudinal study, class-based testing sessions of about 90 minutes were realized every eight months. All tests were paper-pencil based. All tests were provided by two trained co-workers, and additionally supervised by a teacher to further ensure high motivation and discipline. Due to time restrictions, the content of the sessions had to be varied across assessment occasions. Goal orientations in the sense of learning orientation and

approach performance orientation were assessed only once when students were at the end of grade five. Measures of metacognitive knowledge and achievement were applied more frequently. Whereas metacognitive knowledge and achievement in the domain of EFL were assessed every eight months, metacognitive knowledge and achievement in the domain of reading were assessed every 16 months.

As noted above, we were interested in the predictive value of goal orientation from grade five for later metacognitive knowledge and achievement. Goal orientations were assessed at the end of grade 5. Achievement and metacognitive knowledge assessments in both domains took place at the middle of grade 6 and again at the start of grade 7 for EFL and at the end of grade 7 for reading. Thus, the chronological order of the assessments permits a longitudinal perspective on the predictive power of goal orientation in the long run. Testing occasions and relevant measures are shown in Table 1.

Table 1. *Overview of measurement occasions and assessed variables*

	End grade five	Middle grade six	Start grade seven	End grade seven
Learning orientation	t1			
Performance orientation	t1			
MK - reading		t2		t3 for reading
Reading Achievement		t2		t3 for reading
MK - EFL		t2	t3 for EFL	
EFL Achievement		t2	t3 for EFL	

Note. MK = metacognitive knowledge; EFL = English as a foreign language

Data Analysis

Missing data. To deal with missing data due to non-response and panel-attrition typical for longitudinal studies, we decided to apply model-based imputation, using the full-information-maximum-likelihood estimation provided by M*plus* 6 (Muthen & Muthen, 2007). Analyses concerning missing data were computed to test for systematic patterns of missing data. Most of the missing values were due to the fact that some students had left their school and thus the sample, and that other students were absent at one or more testing occasions. The full-information-maximum-likelihood estimation was chosen because it is supposed to be superior to list-wise deletion even if missings are not completely at random (Allison, 2001). Overall, the missing rate on the relevant variables ranged between 8% for the assessment of

goal orientation by the end of grade five and 27 % for the reading achievement assessed by the end of grade seven.

Path analysis. To assess the predictive effect of learning and performance goal orientation on metacognitive knowledge and achievement regression path analyses were conducted with goal orientation as predictor for metacognitive knowledge as well as achievement. For analysis of indirect effects of goal orientation on achievement, mediator models were specified with metacognitive knowledge as the mediating variable. To rule out effects of goal orientations due to classroom related goal structures (e.g. Murayama & Elliot, 2009; Zubković & Kolić-Vehovec, 2014) intra class correlations were computed and were below 0.10. The clustered data structure due to class wise testing was accounted for in all of the following analysis by including class type as a cluster variable using the robust MRL estimate in M*plus* 6.

Results

The statistical results of the hypothesis tests are presented separately for the domains of reading and EFL. The mean values, standard deviations as well as the bivariate correlation for the domains of reading are presented in Table 2 followed by mediation analysis for learning and performance orientation (presented in Figures 2 and 3) and a cross-lagged analysis for learning and performance orientation (presented in Figures 4 and 5). The mean values, standard deviations and bivariate correlations for the domains of EFL are presented in Table 2, followed by the mediation analysis for performance orientation (Figure 6) and the cross-lagged analyses for performance orientation (Figure 7). No further analysis concerning learning orientation was conducted for EFL.

For the domain of reading, the coefficients depicted in Table 2 indicate significant (but small) positive correlations between learning orientation and metacognitive knowledge as well as achievement in reading, regardless of measurement occasions. On the other hand, the bivariate correlations between performance orientation, metacognitive knowledge, as well as achievement indicate significant but small negative relations on both measurement occasions.

Table 2. *Means, standard deviations and correlation coefficients for the domain of reading*

	M	*SD*	**1**	**2**	**3**	**4**	**5**
1. Learning orientation (t1)	14.77	3.18	1				
2. Performance orientation (t1)	5.46	2.22	.25**	1			

3.	MK - reading (t2)-WLE	0.69	0.92	.13**	-.14**	1		
4.	MK - reading (t3)-WLE	0.79	0.97	.12**	-.14**	.51**	1	
5.	Reading achievement (t2)-WLE	0.99	0.85	.14**	-.14**	.35**	.32**	1
6.	Reading achievement (t3)-WLE	1.37	1.13	.13**	-.11**	.33**	.37**	.66**

Note. MK = metacognitive knowledge; WLE = weighted likelihood estimates; * $p < .05$. ** $p < .01$

As postulated in hypothesis one, bivariate analyses for the domain of reading (Table 2) showed significant effects of learning orientation on achievement in grade six (t2) and in grade seven (t3), indicating a positive predictive power of learning orientation for later achievement in this domain. Analyses on the predictive effects of learning orientation on metacognitive knowledge in reading showed significant positive effects of learning orientation on metacognitive knowledge at t2 and t3, while metacognitive knowledge at t2 significantly predicted later achievement.

The indirect effects of the two types of goal orientation on reading achievement at grade seven were analyzed using metacognitive knowledge at grade six as a mediating variable. Learning orientation had a significant indirect effect on achievement (hypotheses 2 for reading) which was mediated by metacognitive knowledge in reading (see Figure 2).

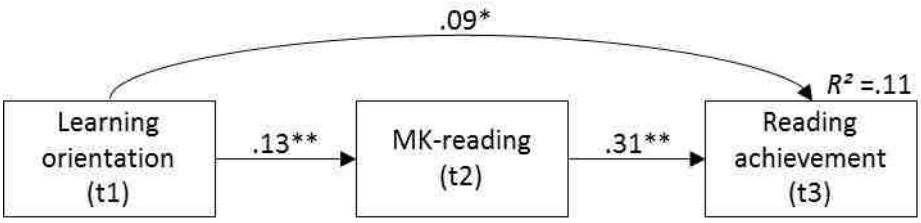
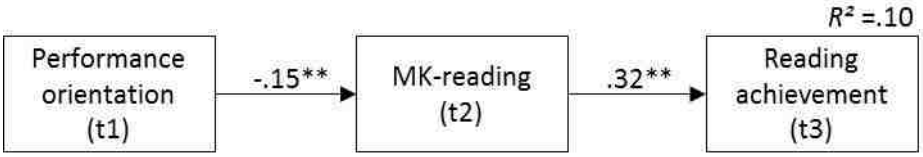


Figure 2. Saturated mediation model for metacognitive knowledge in reading (standardized parameter estimates). Note. MK = metacognitive knowledge. * $p < .05$. ** $p < .01$.

In accordance with hypothesis three, performance orientation turned out to be a significant negative predictor for achievement in reading at t2 and t3. Analyses on the predictive value of performance orientation on metacognitive knowledge indicate a significant negative effect of performance orientation on metacognitive knowledge at t2 and t3 (Table 2). Furthermore, performance orientation had no significant direct effect on reading achievement

at t3. The significant indirect effect on achievement in reading (hypotheses 4) was completely mediated be metacognitive knowledge (see Figure 3).

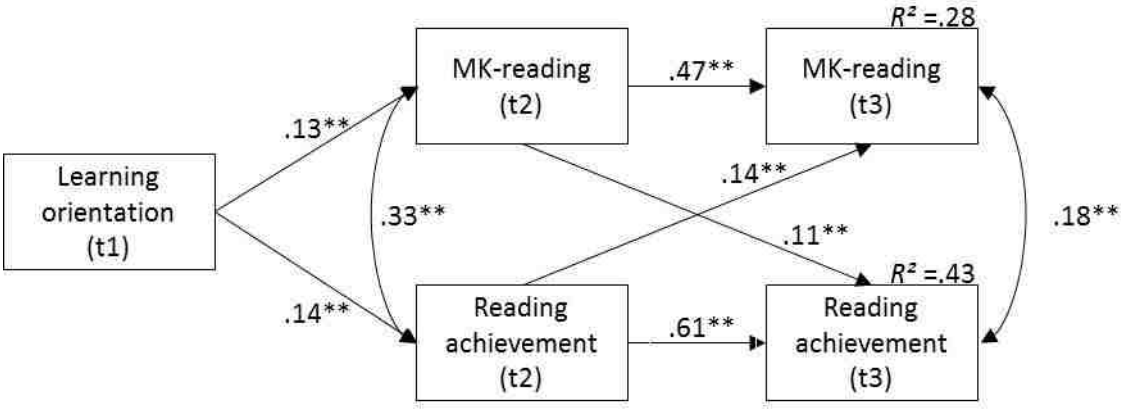


Chi² = 2.78, df = 1, Correction Factor = .87, CFI = .98, TLI = .95, RMSEA = .05.

Figure 3. Restricted mediation model for the indirect effect of performance orientation on achievement in reading (standardized parameter estimates).

Note. MK = metacognitive knowledge. * $p < .05$. ** $p < .01$.

In order to test the strength of the effect of goal orientation while controlling for the autoregressive effect of prior metacognitive knowledge and prior achievement in the domain of reading, a cross-lagged-panel model with metacognitive knowledge and achievement at t2 and t3 was computed. The cross-lagged-panel model with learning orientation as the predictor is shown in Figure 4, and the model with performance orientation as the predictor is shown in Figure 5.

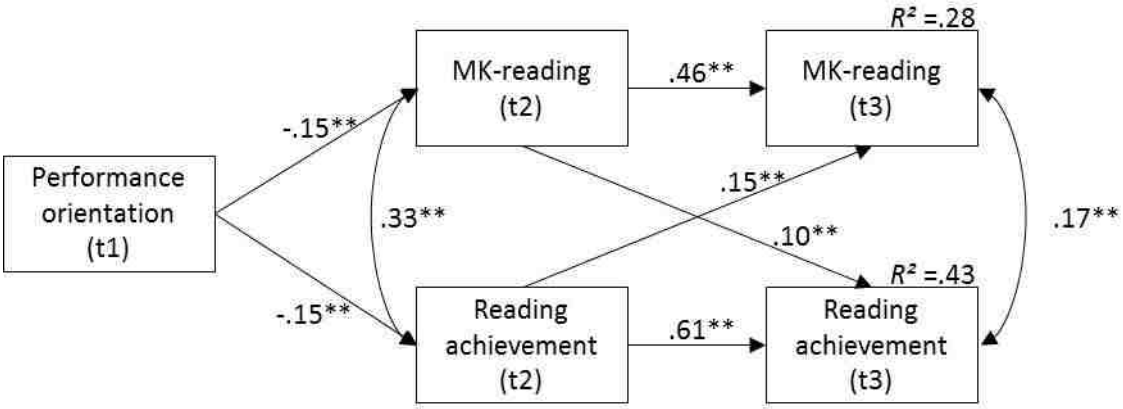


Chi² = 1.71, df = 2, Correction Factor = .95, CFI = 1.00, TLI = 1.00, RMSEA < .01

Figure 4. Cross-lagged-model for the indirect effect of learning orientation on achievement and metacognitive knowledge in reading (standardized parameter estimates)

*Note. MK = metacognitive knowledge. * $p < .05$. ** $p < .01$*

In line with the hypotheses one and two for the domain of reading, the total indirect effect of learning orientation on achievement was significant and positive (β = .10, p < .01), with a specific indirect effect of prior achievement (β = .08, p < .01) and a specific indirect effect of metacognitive knowledge (β = .03, p < .01). The total indirect effect of learning orientation on metacognitive knowledge was significant (β = .08, p < .01) and was significantly mediated by prior metacognitive knowledge (β = .06, p < .01) and to a lesser extent by prior achievement (β = .02, p < .05).



Chi² = 1.32, df = 2, Correction Factor = 1.26, CFI = 1.00, TLI = 1.00, RMSEA = .00

Figure 5. Cross-lagged-model for the indirect effect of performance orientation on achievement and metacognitive knowledge in reading (standardized parameter estimates)

Note. MK = metacognitive knowledge. * p < .05. ** p < .01

In line with hypotheses three and four for the domain of reading, the total indirect effect of performance orientation on achievement was significant and negative (β = -.10, p < .01). The specific indirect effect of prior achievement was significant (β= -.09, p < .01) while the specific indirect effect of metacognitive knowledge turned out to be significant but lower (β = .02, p < .05). A similar pattern of results was obtained for the indirect effects of performance orientation on metacognitive knowledge. Again the total indirect effect (β = -.09, p < .01) and the specific indirect effect of achievement (β = -.02, p < .05) as well as that of metacognitive knowledge (β = .07, p < .01) were significant.

For the domain of EFL, mean values, standard deviations and bivariate correlations are reported in Table 3. In correspondence to the domain of reading path regression analyses were computed to analyze the predictive value of learning and performance orientation on metacognitive knowledge and achievement in EFL.

Table 3: *Means, standard deviations and correlation coefficients for the domain of EFL*

	M	*SD*	**1**	**2**	**3**	**4**	**5**
1. Learning orientation (t1)	14.77	3.17	1				
2. Performance orientation (t1)	5.46	2.22	.25**	1			
3. MK - EFL (t2) (0-28)	15.59	4.76	.06	-.16**	1		
4. MK - EFL (t3) (0-28)	16.30	5.17	.09*	-.21**	.52**	1	
5. EFL achievement (t2)(0-35)	6.92	2.47	.04	-.20**	.39**	.31**	1
6. EFL achievement (t3)(0-35)	8.50	3.10	.08*	-.15**	.34**	.29**	.76**

Note. MK = metacognitive knowledge. * $p < .05$. ** $p < .01$

The results of the regression path analysis with learning orientation as predictor for achievement and metacognitive knowledge (hypothesis one) showed that learning goal orientation did not have any impact given that neither in grade six (t2) nor in grade seven (t3) significant effects of learning orientation on achievement in EFL were found (t2: $\beta = .04$, $p > .05$; t3: $\beta = .08$, $p > .05$). The effect of learning orientation on metacognitive knowledge was also not significant at t2 ($\beta = .06$, $p > .05$) and at t3 ($\beta = .09$, $p > .05$). Because of the missing direct effect of learning orientation on achievement, no mediation analysis was conducted (hypotheses 2, no Figure) and no cross-lagged-analysis was conducted for the effects of learning orientation in the domain of EFL (no Figure).

In accordance with hypotheses three, performance orientation negatively affected later achievement at t2 and t3. Moreover, analyses on the predictive value of performance orientation for metacognitive knowledge indicated a negative effect of performance orientation on metacognitive knowledge, both at t2 and t3.

Analyses on the indirect effect of performance orientation (hypothesis four) revealed that the effect of performance orientation on achievement at t3 was mediated by metacognitive knowledge at t2. The restricted mediation model (without a direct path of performance orientation on achievement) indicates a complete mediation of the negative effect of performance orientation on achievement (see Figure 6).

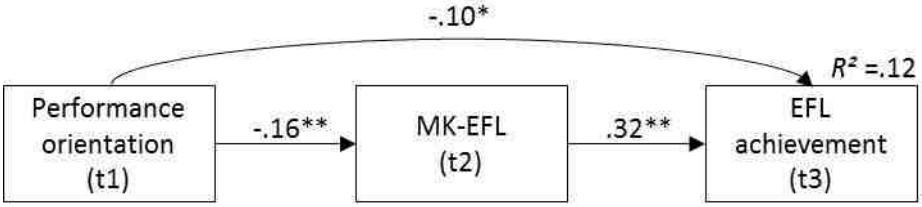
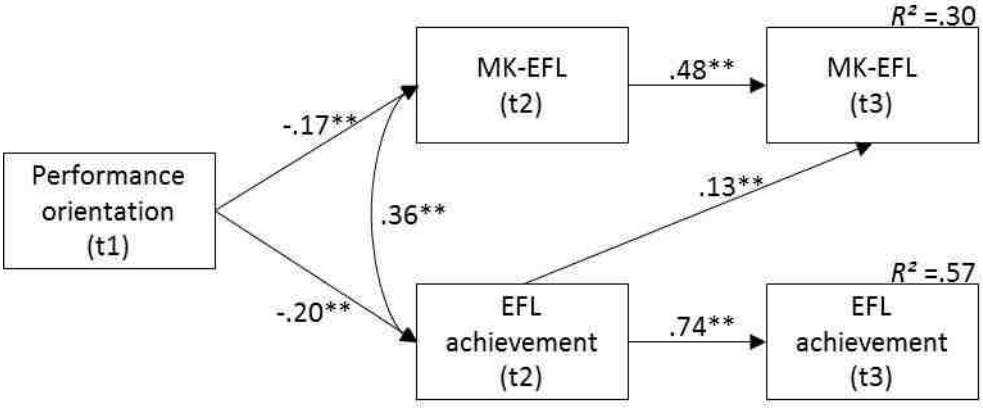


Figure 6. Saturated mediation model for metacognitive knowledge in EFL (standardized parameter estimates)

Note. MK = metacognitive knowledge; EFL = English as foreign language. * $p < .05$. ** $p < .01$

Again, a cross-lagged-panel model was computed to further analyze the impact of performance orientation by controlling for the autoregressive effects of metacognitive knowledge and achievement. The cross-lagged panel model for EFL with performance orientation as the predictor variable is presented in Figure 7.



Chi² = 11.16, df = 2, Correction Factor = .82, CFI = 1.00, TLI = .99, RMSEA = .08

Figure 7. Cross-lagged-model for the indirect effect of performance orientation on achievement and metacognitive knowledge in EFL (standardized parameter estimates)

Note. MK = metacognitive knowledge; EFL = English as foreign language. * $p < .05$. ** $p < .01$.

In line with hypotheses three and four for the domain of EFL, the total indirect effect of performance orientation on achievement was significant ($\beta = -.15$, $p < .001$) as was the specific indirect effect of prior achievement ($\beta = -.14$, $p < .001$). Metacognitive knowledge had no indirect effect on achievement in the domain of EFL. A total indirect effect of performance orientation on metacognitive knowledge was found ($\beta = -.11$, $p < .001$). The

dependent variable of prior achievement in EFL (β = -.03, $p < .01$) and of metacognitive knowledge in EFL (β = .08, $p < .01$) had a negative indirect effect.

Discussion

In accordance with our first hypothesis, students' learning orientation positively predicted their later academic achievement and their later metacognitive knowledge in the familiar domain of reading, but not in the novel domain of EFL. The positive effect of learning orientation on achievement in reading was completely mediated by an indirect effect of learning orientation on metacognitive knowledge (hypothesis 2) In line with hypothesis three, performance orientation turned out to be a negative predictor of achievement in the domain of reading as well as the domain of EFL and also affected later metacognitive knowledge in both domains in a negative way. Alike the positive effect of learning orientation, the negative effect of performance orientation on achievement was completely mediated by metacognitive knowledge (hypothesis 4). Results from the cross-lagged models indicated that the mediating effects of metacognitive knowledge remained significant after controlling for prior achievement.

Learning orientation had a positive effect not only on performance but also on metacognitive knowledge in reading. This findings are in line with the assumption that metacognitive knowledge develops as a result of intensive engagement and the execution of learning activities in a particular domain (Borkowski, et al., 2000). The mediating effect of metacognitive knowledge between goal orientation and performance in reading indicates that learning orientation can increase achievement through a positive effect on the development of metacognitive knowledge in this domain. As strategy use is an important prerequisite for the development of metacognitive knowledge this findings support the assumption of a positive relation between leraning orientation and learning-related behaviors (Elliot, et al., 1999; Midgley, et al., 2001), such as self-regulations of motivation strategies (Paulino, Sá, & Lopes da Silva, 2016) and the use of deep level learning strategies (Coutinho & Neuman, 2008; Elliot, et al., 1999; Pintrich, 2000b). From a practical point of view, this indirect effect is important as it implies that the promotion of learning orientation is beneficial not only to improve performance but also to build up the learning-related metacognitive knowledge which enables learners to become adaptive in their learning and to apply strategies flexibly and efficiently. The positive effect of learning orientation on performance and metacognitive

knowledge was found only for the more complex tasks and requirements in the domain of reading. This findings support the assumption that students with a learning goal orientation prefer challenging tasks (Ames & Archer, 1988) and benefit most when learning tasks are more demanding or complex (Utman, 1997). In the domain of EFL, the students of our study had acquired only basic experiences by the end of grade five, and performance had to be tested with a rather basic measure. As expected, the early achievement in this domain was unaffected by learning goal orientation. This might be due to the fact the students had to build up basic knowledge in this domain. Especially the need to acquire vocabulary and grammar rules which probably implies rote learning and repetition might leave little space for the deeper level learning processes which are supported by students' learning orientation (Elliot, et al., 1999). In line with findings regarding the relation between goal orientation and task complexity, the missing relation between learning orientation and achievement in EFL can be taken as an indication that learning tasks require a certain degree of complexity. That is, they have to go beyond the level of rote learning in order to reveal the benefit of a learning orientation (Utman, 1997). Learning has to be somewhat challenging and demanding in order to not only disclose positive effects of learning orientation on achievement, but also to provide opportunities for the development of metacognitive knowledge (Weinert, 1984). Therefore, the finding that learning goal orientation has no significant effect on metacognitive knowledge in grade six is in line with theoretical assumptions regarding its development (Borkowski, et al., 2000). By grade seven, learning orientation marginally predicted metacognitive knowledge in EFL, suggesting again that learning processes might need to become more complex before learning orientation may influence strategy-related metacognitive knowledge development. With further measurement occasions, it remains to be seen whether the predictive value of learning orientation for the development of metacognitive knowledge increases and whether the developing metacognitive knowledge or the learning orientation itself eventually predicts achievement in EFL.

Consistent with earlier findings, performance orientation turned out to be a negative predictor of achievement in both domains. Even though students were beginners in EFL learning and thus had to deal with rather basic tasks, higher performance orientation tended to correspond with lower academic achievement. Students' performance orientation also affected later metacognitive knowledge in both domains in a negative way. These findings are in line with our assumption that performance orientation is detrimental to the development of metacognitive knowledge. It affects learning behaviors in a negative way, leading to

superficial learning and quantitatively as well as qualitatively inferior strategy use (Elliot, et al., 1999). Our findings indicate that the negative effect of performance orientation on learning behavior negatively affects the development of higher order knowledge about strategies, which constitutes an important resource for further learning and achievement. Furthermore, the findings indicate that this metacognitive knowledge mediates the negative effect of performance orientation on achievement in both domains. In the domain of reading, the negative indirect effect of performance orientation on achievement remains significant, even after controlling for the autoregressive effect of achievement. In EFL, the mediating effect of metacognitive knowledge became non-significant when controlling for the autoregressive effect of achievement. This might be due to the early developmental stage of metacognitive knowledge in the novel domain of EFL, especially as the indirect effect was found in the more familiar domain of reading. More measurement occasions will be required to further investigate the development of metacognitive knowledge in EFL and to monitor at which stage a predictive effect on achievement occurs.

Some *limitations* need to be considered when interpreting the present results. The measures applied vary in their level of reliability. Even though the alpha values are acceptable the scales are statistically loaded with a certain degree of measurement error which undermines correlations and may lead to an underestimation of the relations between the constructs we investigated. Differences in the two achievement domains may be partially confounded by the fact that we had to use domain specific measurement approaches – multiple choice reading test vs. stumble word test for EFL - and tests were administered at different intervals (EFL tests were provided every 8 months, whereas reading tests were given every 16 months). Thus we cannot completely rule out that some of the differences between the two domains are due to methodological variation. Nevertheless, the cross-lagged models support the mediation assumption and indicated that the mediating effect of metacognitive knowledge remained significant even when prior achievement was controlled for.

In conclusion, our findings underscore the relevance of motivational goal orientation for learning and achievement. By revealing that goal orientation effects the development of metacognitive knowledge, we could show that an important resource for strategic learning is impaired by performance orientation or respectively increased by learning orientation. As metacognitive knowledge serves as a prerequisite for (self-regulated) learning and achievement, the present findings stress the need to address students' learning orientation in

secondary school and to establish a class climate which focuses on learning processes and learning how to learn instead of performance outcome, competition and grades.

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