EXCELLENCE

Essays in Honour of Kurt A. Heller

edited by

Albert Ziegler and Christoph Perleth

LIT

Chapter 11

Antecedents of Achievement Goals: Results of a Study in the Context of Mathematics Instruction

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Gifted individuals need an extensive learning history in their talent domain in order to develop excellence (Ericsson, Roring, & Nandagopal, 2007). In his model of giftedness, Kurt A. Heller highlights environmental conditions, such as a positive family climate or a good quality of instruction, and non-cognitive personal characteristics, such as an adaptive coping with stress or an adaptive achievement motivation, as moderators for this learning process (e.g. Heller, 2005; Heller, Perleth, & Lim, 2005). In our contribution we focus on achievement motivation, which is considered as an important factor in Heller's work and also in other models of giftedness (for an overview see Sternberg & Davidson, 2005). We focus on one of the most prominent and fruitful theoretical perspectives on the motivation individuals have to achieve and to learn, namely achievement goal theory (for a current overview see Maehr & Zusho, 2009). It is situated in a social-cognitive view of motivation and focuses on the types of goals an individual pursues in social learning and achievement situations. The primary focus of this contribution is on the antecedents of achievement goals. In the tradition of Kurt A. Heller and his model assumptions, we consider both the personal and environmental origins of achievement goals simultaneously – an approach one does not find in the literature too often.

In the present work, after a brief overview of theoretical assumptions and empirical studies on personal and environmental antecedents of achievement goals, we will present the results of a study conducted with 9th grade students, and classrooms, in the secondary school subject of Mathematics. We incorporate implicit theories of own abilities, self-efficacy and cognitive abilities as individual antecedents and classroom goal structures as environmental antecedents.

1.1 Types and Effects of Achievement Goals

Early research on achievement goals focused on two contrasting types of goals which have been labeledlearning versus performance goals (Dweck & Elliott, 1983), task involved versus ego involved goals (Nicholls, 1984), mastery versus ability focused goals (Ames, 1992), or task focused versus ability focused goals (Maehr & Midgley, 1991). Most researchers today view these goal sets as having sufficient overlap to be considered conceptually similar constructs, and use the terms "mastery goals" and "performance goals" to describe these qualitatively different forms of goals (see Elliot, 2005; Maehr & Zusho, 2009; Meece, Anderman & Anderman, 2006): Mastery goals are defmed in terms of a focus on developing one's abilities, mastering a new task, trying to accomplish something challenging, and trying to understand learning materials. Success is evaluated in terms of self-improvement, and students derive satisfaction from the inherent qualities of the task. In contrast, performance goals represent a focus on demonstrating good performances relative to others, striving to be better than others, and using social comparison (normative) standards to make judgments of ability and performance. Since the late 1990s, researchers have distinguished between two types of performance goals. Performance-approach goals focus on

the attainment of favorablejudgments of competence, whereas performance-avoidance goals focus on avoiding unfavorablejudgments of ability (Elliot & Church, 1997; Elliot & Harackiewicz, 1996).[9]

A vast amount of empirical evidence has been collected to support the positive relationship between mastery goals and achievement-related behaviour (e.g. Ziegler, Dresel, & Stoeger, 2008; Ziegler & Heller, 2000). Students who focus on mastery goals persist at difficult tasks (Elliott & Dweck, 1988; Stipek & Kowalski, 1989), report high levels of task involvement (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000), high levels of effort and persistence (Grant & Dweck, 2003; Wolters, 2004), and use learning strategies that enhance conceptual understanding (Ames & Archer, 1988; Grant & Dweck, 2003; Meece & Miller, 2001). In sharp contrast, performance-avoidance goals show negative relationships to achievement-related behaviors like surface-level learning strategies (memorizing and rehearsing information) which do not necessarily promote conceptual understanding (Elliot & Harackiewicz, 1996; Kaplan, Middleton, Urdan, & Midgley, 2002), and are associated with self-handicapping strategies (e.g. procrastinating; Urdan, Midgley, & Anderman, 1998) and lower performance levels (Elliot & Church, 1997; Elliot & McGregor, 2001; Skaalvik, 1997). The effects reported for performance-approach goals are more ambivalent and also depend on the type of task at hand. Midgley, Kaplan, and Middleton (2001) reported that performance-approach goals are linked to challenge avoidance, fear of failure, self-handicapping, help avoidance, less cooperativeness and a desire to work alone. In contrast, Harackiewicz et al. (2002) argued that these associations are inconsistent and that the correlations found for performance-approach goals with learning and achievement are primarily positive. For example, performance-approach goals are positively associated with persistence and achievement outcomes, especially for college students (Elliot, McGregor, & Gable, 1999; Harackiewicz et al., 2002).

1.2 Origins of Achievement Goals

With the appearance of achievement goal theory, work started on determining the antecedents of different achievement goals. Thus far, both the personal and contextual origins of achievement goals have been discussed in the literature, whereby the empirical evidence is quite mixed. The following section provides a brief overview of the personal and contextual origins of achievement goals.

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[9]Beginning in the early 2000s, researchers also made a distinction between an approach and an avoidance component within mastery goals, resulting in a full 2 x 2 framework of achievement goals (Elliot & McGregor, 2001; Pintrich, 2000). Since evidence pertaining to mastery avoidance goals has been rather sparse and somewhat mixed to date (see Moller & Elliot, 2006, for an overview), we refer in this contribution to the "classical" trichotomous model of achievement goals.

1.3 Personal Antecedents of Achievement Goals

A comprehensive theoretical foundation as well as considerable empirical work is available for Dweck's assumptions on the antecedents of achievement goals (Dweck, 1986; Dweck & Leggett, 1988; see also Heller, Finsterwald, & Ziegler, 2001). In her theory, she assumes two contrasting types of implicit theories of intelligence: the (often implicit) belief that intelligence is a malleable and controllable quality (labeled an "incremental theory"), and the belief that intelligence is a fixed and uncontrollable trait ("entity theory"). According to Dweck's theory, students holding an incremental theory should pursue mastery goals, because they believe that they can develop their abilities. In contrast, students holding an entity theory believe that their gifts are fixed and, therefore, should favor performance goals in order to attain favorablejudgments. Empirical evidence to support this view has been provided by Aylor (2000), Dweck and Sorich (1999), Dweck and Leggett (1988), Stone (1998) as well as Stipek and Gralinski (1996). Only partial support for Dweck's postulates was offered by Roedel and Shraw (1995). They found that the endorsement of an entity theory of intelligence is related to the pursuit of performance goals and unrelated to the pursuit of mastery goals. Contrary to Dweck's theory, Hayamizu and Weiner (1991) found in their study that an incremental theory is related to both mastery and performance goals. Moreover, Dupeyrat and Mariné (2001, 2005) report that the belief in a fixed entity is not associated with performance goals, but is negatively correlated with mastery goals. In general, research in the European context does not seem to support Dweck's assumption on the link between implicit theories and achievement goals very strongly (e.g. Ziegler, 2001). Nevertheless, the relationship seems to be somewhat stronger when implicit theories are conceptualized with respect to domain-specific abilities instead of general intelligence, and with respect to ability improvement instead of fluctuations in any direction (cf. Schloz & Dresel, 2011). In their meta-analysis Payne, Youngcourt, and Beaubien (2007) report that incremental theories of intelligence have a moderate positive correlation with mastery goals, and a small negative correlation with both a performance-approach orientation and a performance-avoidance orientation.

Another aspect of beliefs which is considered to be important for setting achievement goals are self-efficacy beliefs; they are defined as (domain or task specific) beliefs about one's own capacity to learn or to perform behaviorsat designated levels (Bandura, 1986, 1997). Self-efficacy is closely related to a person's (domain-specific) ability self-concept, i.e. his or her perceptions of own abilities (see Marsh & Craven, 1987, for an overview). Against the theoretical background of self-determination theory (Deci & Ryan, 2000), one can argue that positive evaluations of own capacities and, therefore, a sufficient gratification of the basic need for competence, is a necessary condition in the development of autonomous types of motivation, among which mastery goals can be counted. This is supported by findings that self-efficacy enjoys a positive relationship with mastery goals and a negative relationship with performance

goals (Phillips & Gully, 1997). Moreover, in their meta-analysis, Payne et al. (2007) reported that self-efficacy has a strong positive relationship with mastery goals, a negative relationship with performance-avoidance goals and a weak negative relationship with performance-approach goals.

Using the above mentioned theoretical assumptions in self-determination theory (Deci & Ryan, 2000), a positive relationship with mastery goals and a negative relationship with performance-approach goals could be expected, not only with respect to subjective representation of own abilities, but also for the (objective) abilities themselves. Eison (1979, 1981) found empirical evidence that students pursuing mastery goals possess higher levels of cognitive abilities when compared to performance goals oriented students. Nevertheless, Bandura and Dweck (1985), as well as Dweck (1986), found no relationship between cognitive abilities and achievement goals. Since the theoretical argumentation for a link between cognitive abilities and achievement goals is somewhat vague, and the empirical indications are based on too few studies, more research would be helpful here. [10]

1.4 Contextual Antecedents of Achievement Goals

When explaining inter-individual differences in achievement goals, in addition to individual antecedents, the contextual influences of achievement and learning environments should be taken into account. Conceptually, Ames (1992; Ames & Archer, 1988) considered the setting of achievement goals to be primarily dependent on environmental conditions. Accordingly, teachers may create different goal structures in the classrooms through their use of various instructional, evaluation, and grouping strategies (Kaplan, Gheen, & Midgley, 2002). Classroom goal structures refer to the extent to which the learning environment allows for, or determines, the pursuit of mastery and performance goals (Ames, 1992). In more detail, it can be assumed that a classroom mastery goal structure is present when the classroom environment is characterized by an intense focus on skill development, mastery, understanding, and improvement. On the other hand, a classroom performance structure is assumed to exist when classroom instruction is characterized by a predominant focus on the products of learning in terms of performance results and their evaluation, through competitive instructional and grading practices, public feedback practices, and ability grouping (Meece et al., 2006). Corresponding to personal achievement goal, classroom goal structures were theoretically conceptualized according to the trichotomous model, incorporating a differentiation between classroom performance-approach goal structures and classroom performance-avoidance goal structures.

[10] It should be noted that, in the literature, achievement motive is also discussed as a personal antecedent of achievement goals (rf. Elliot, 2005), however, this could not be considered in the present study.

Empirical investigations have revealed that classrooms can be systematically differentiated in accordance with student perceptions of the goal structures in their classrooms, and that when students set achievement goals they correspond with these perceived classroom goal structures (e.g. Church, Elliot, & Gable, 2001; Finsterwald, Ziegler, & Dresel, 2009; Kaplan et al., 2002). For example, Meece (1991) reported in an early investigation that teachers of low vs. high mastery goal oriented students differ in the degree to which they promote meaningful learning and understanding, adapt instruction to the developmental levels and personal interests of their students, establish learning structures supportive of student autonomy and peer collaboration, and emphasize the intrinsic value of learning. Perceived classroom goal structures explain about 5% to 35% of student variance in individual achievement goals (see Meece et al., 2006), although more research is needed to address such links between various instructional practices, such as teacher feedback practices and student perceptions of classroom goal structures (cf. Dresel, Martschinke, & Kopp, 2009; Patrick, Anderman, Ryan, Edelin, & Midgley, 2001; Turner et al., 2002).

Another open question is whether the theoretically postulated differentiation between performance-approach and performance-avoidance components is empirically valid on the contextual level, although this differentiation is undisputed on the level of personal goal adoption (cf. Schwinger & Stiensmeier-Pelster, in press). In many studies the performance-avoidance component of goal structure was omitted due to low internal consistency or non-significant differences between classrooms, in some cases it is combined with the performance-approach goal structure component (e.g. Finsterwald et al., 2009; Kaplan et al., 2002). This is particularly evident in studies in which the Patterns of Adaptive Learning Scales (PALS; Midgley et al., 2000), a standard instrument in the assessment of classroom goal structures from the perspective of the students, was administered. However, empirical evidence for the validity of the trichotomous conceptualization does also exist (Schwinger & Stiensmeier-Pelster, in press).

1.5 Interactions Between Personal and Contextual Antecedents

Recently, in the context of achievement goal theory, researchers have been more sharply focused on the interplay between personal factors and contextual factors, above and beyond the direct (partial) effects of both. This research has addressed the person-environment-interaction with regard to consequences, including interactional effects, of personal achievement goals, classroom goal structures on achievement and learning outcomes (e.g. Lau & Nie, 2008; Linnebrink, 2005; Murayama & Elliot, 2009). Here, several potential interactions between personal achievement goals (implicitly conceptualized as stable goal setting tendencies) and classroom goal structures were hypothesized (cf. Murayama & Elliot, 2009). Among others, matching effects (when personal achievement goals are congruent to the contextual goal structure optimal achievement and learning behaviour occurs), vitiation effects (unfavorable goal

structures vitiate the positive effects of favorable personal achievement goals) and buffering effects (favorable goal structures buffer against the undesirable consequences of unfavorable personal achievement goals) were discussed.

These interactional approaches to analyzing the consequences of personal achievement goals and goal structures could be transferred to the analysis of the antecedents of goal setting processes under the condition that conceptions of achievement goals are more situation-specific and are therefore dependent on (instead of independent from) contextual goal structures (Ames, 1992; Ames & Archer, 1988; see also Dresel, Berner, & Fasching, 2011). In this case, it can be hypothesized that individual antecedents vary in their relevance for goal adoption, depending on contextual conditions. For example, it may well be the case that the positive effects of an incremental theory of own abilities in terms of the intense adoption of personal mastery goals are vitiated by a strong classroom performance goal structure, and the negative effects of an entity theory of own abilities in terms of the seldom adoption of personal mastery goals are buffered by a strong classroom mastery goal structure. To the best of our knowledge, to date, no empirical evidence has been collected to determine whether such interactions between the personal and contextual antecedents of achievement goals exist.

1.6 Research Questions

The brief overview revealed that implicit theories of own intelligence or abilities, self-efficacy, and cognitive abilities are discussed as personal antecedents of achievement goals. As environmental antecedents, classroom goal structures can be assumed to be an important factor. All of the findings referred to are based on several studies in several contexts, but very few studies have applied a systematic consideration of both personal and environmental antecedents. In particular, there are research deficits with regard to possible interactional effects of personal and contextual factors. Therefore, the main research question of the present research concerns an explanation of differences in individual achievement goals, through both personal and contextual origins, with a consideration of potential interactions between the two (cf. Dresel et al., 2011; Murayama & Elliot, 2009). Moreover, it addresses whether a dichotomous or a trichotomous conceptualization of classroom goal structures is valid to describe contextual influences on achievement goals (cf. Schwinger & Stiensmeier-Pelster, in press).

2 Method

2.1 Procedure and Participants

In pursuing the research questions, data collected in a larger research study conducted in the context of Mathematics instruction in upper secondary school

(German "Gymnasium") were analysed (see Dresel & Grassinger, 2007). This study included a total of three measuring points as well as process-oriented assessments of learning processes using diaries. Data from the first measuring point were used in the present analyses. Here the students were asked to complete a test which assessed quantitative cognitive abilities, as well as a questionnaire concerning aspects of individual motivation regarding the subject of Mathematics, perceptions of Mathematics instruction in their classrooms and biographical information. The testing sessions were scheduled during regular classroom instruction and were guided by trained research assistants. Student participation was unsolicited and with parental agreement. The present analyses included all students for which data at the first measuring point were available. These were $N = 1064$ ninth graders enrolled in 41 different classrooms from 19 schools. Their average age was 15.4 years ($SD = 0.47$) and the proportion of female came to 59.3%.

2.2 Measurements

All measurements were operationalized with respect to the specific domain of the scholastic subject of mathematics. Scale means were calculated such that higher scale values correspond to a stronger presence of the construct (implicit theory: a more incremental view of own abilities).

2.2.1 Achievement Goals

In order to assess students' personal achievement goals, we used a domain-specific adaptation the scales developed by Spinath, Stiensmeier-Pelster, Schöne, and Dickhäuser (2002). Here students can more or less agree to statements such as "In Math class, I want to learn something interesting" (mastery goals, eight items), "In Math class, I want to show that I am good at something" (performance-approach goals, seven items) or "In Math class, I don't want the other students to think I am stupid" (performance-avoidance goals, eight items) using a Likert-type scale ranging between 1 (*stronglydisagree*) and 5 (*strongly agree*). Internal consistencies showed a Cronbach's $\alpha = .83$ (mastery goals), $\alpha = .80$ (performance-approach goals), and $\alpha = .84$ (performance-avoidance goals).

2.2.2 Implicit Theory of Own Abilities

In order to assess implicit theories with respect to domain-specific abilities in an uni-directional manner, we used a six item scale which had previously been implemented by Dresel and Ziegler (2006). A sample item reads: "I can increase my abilities in Mathematics". The items were presented alongside Likert-type scales ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). $\alpha = .66$.

2.2.3 Self-Efficacy

To assess self-efficacy, we used a five-item scale developed by Dresel, Schober, and Ziegler (2005). Sample item: "In the future, I will certainly perform well in

Math". Answers were recorded using Likert-type scales ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). $\alpha = .83$.

2.2.4 Cognitive Abilities

The cognitive abilities of the students in the quantitative area were assessed with the German Cognitive Abilities Test for 4th to 12th graders (KognitiverFähigkeits-Test für 4. bis 12. Klassen, Revision, KFT 4–12+R) developed by Heller and Perleth (2000). We selected the KFT 4–12+R because it is characterized by excellent psychometric properties, and the quantitative abilities which can be measured with the KFT 4–12+R are most relevant to the scholastic domain under consideration here. We used two sub-scales assessing quantitative cognitive abilities, namely the sub-tests "Mengenvergleiche" (comparisons of quantities) and "Zahlenreihen" (number sequences)". The raw scores for the two sub-tests were transformed into one *T*-value per student using the norms for the short version of the KFT 4–12+R.

2.2.5 Perceived Classroom Goal Structures

To assess the classroom goal structures, the respective sub-scales of the Patterns of Adaptive Learning Scales (PALS; Midgley et al., 2000) were translated into German and adapted to the context of Mathematics instruction. The scales were used to determine the degree to which pupils saliently perceive options and affordances to adopt certain goal classes in their Mathematics class. With the scales, classroom goal structure is operationalized in accord with the trichotomous model, i.e. aside from a mastery goal structure. The scales included six items measuring perceived mastery goal structure ("In our Math class ... how much you improve is really important"), three items measuring perceived performance-approach goal structure ("...getting right answers is very important") and five items measuring perceived performance-avoidance goal structure ("...showing others that you are not bad is really important"). The items were presented alongside six-point Likert-type scales, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Internal consistencies came to $\alpha = .76$ (mastery goal structure), $\alpha = .62$ (performance-approach goal structure), and $\alpha = .85$ (performance-avoidance goal structure).

2.3 Missing Data and Analyses

As found in every large study, item non-response was also evident in the present study. Nevertheless, this was a rather seldom phenomena (no item showed a rate of missing values exceeding 5%). These missing values were replaced through an application of the expectation-maximization algorithm prior to all analyses (rf. Peugh & Enders, 2004).

The main analyses were performed using hierarchical linear modelling (HLM; Raudenbusch & Bryk, 2002). HLM is a multilevel random coefficient regression-based technique that permits simultaneous analysis of within-class and between-class sources of variance. The data were represented in a two-level

model with students nested within classrooms. The data analyses were performed using restricted maximum likelihood estimation with HLM 6.06 (Raudenbush, Bryck, & Congdon, 2008).

3 Results

3.1 Preliminary Analyses

In the first step, we analysed whether the distinction between classroom performance-approach goal structure and classroom performance-avoidance goal structure is valid for the present data set (cf. Schwinger & Stiensmeier-Pelster, in press). As the following results indicate, this was not the case: A large correlation was observed between the two components with regard to students' individual perceptions ($r = .56$; attenuation-corrected correlation $r^* = .77$) as well as shared perceptions in the classrooms (classroom-specific aggregates of individual perceptions; $r = .72$). Although an exploratory factor analysis with (non-orthogonal) promax rotation on the level of individual perceptions revealed three factors (as indicated the application of the Eigenvalue criterion and a parallel analysis), these three factors did not seem to correspond to the items of the three postulated classroom goal structures (mastery, performance-approach, performance-avoidance). A two factorial solution could be clearly interpreted: all items on the two PALS sub-scales "classroom performance-approach goal structure" and "classroom performance-avoidance goal structure" loaded on the first factor ($a \geq .50$), whereas all items on the sub-scale "classroom mastery goal structure" loaded on the second factor ($a \geq .44$), and no substantial auxiliary loadings occurred ($|a| \leq .30$). Consequently, we combined the eight items from the two classroom performance goal structure sub-scales to form the single factor "classroom performance goal structure" ($\alpha = .85$).

Table 1 contains the descriptive statistics calculated, as well as the proportions of variance located on the between classroom level and the bivariate correlations. Classroom differences were small, but nevertheless significant, for all individual and contextual variables as indicated by significant intra-class correlations *ICC*.

Regarding the bivariate correlations of achievement goals with their potential individual antecedents, the pattern which emerged was, to a large degree, expected: Mastery goals correlated positively and performance-avoidance goals correlated negatively with an incremental theory of own mathematical abilities, self-efficacy and quantitative cognitive abilities – here correlations were remarkably large for mastery goals and remarkably small for performance-avoidance goals.

Table 1. Descriptive Statistics, Proportions of Variances and Bivariate Correlations

	1	2	3	4	5	6	7	8
Achievement goals								
1. Mastery								
2. Performance-approach	.38*							
3. Performance-avoidance	.01	.46*						
4. Incremental theory of own bilities	43*	.26*	–.09*					
5. Self-efficacy	.52*	.33*	–.12*	.60*				
6. Cognitive abilities	.18*	.07*	–.10*	.21*	.32*			
Classroom goal structure								
7. Mastery	.25*	.07*	.00	.13*	.16*	–.04		
8. Performance	.09*	.40*	.52*	.01	–.01	–.05	–.08*	
M	3.54	3.01	2.30	4.51	4.13	54.16	3.83	2.77
SD	0.71	0.77	0.76	0.64	0.79	8.21	0.65	0.71
ICC	.04*	.04*	.03*	.04*	.02*	.09*	.07*	.04*

Note. $N = 1071$ students in 41 classrooms. *ICC* = Intra-class correlation, quantifies the proportion of variance located on the classroom level.
* $p < .05$.

Performance-approach goals correlated positively (and to smaller degree than for mastery goals) with these three individual antecedents. With regard to contextual antecedents, achievement goals correlated positively with their corresponding classroom goal structure counterparts to a moderate to strong degree (e.g. performance-avoidance goals with classroom performance goal structure). Unexpectedly, small positive correlations were also observed between mastery goals and classroom performance goal structures, and between performance-approach goals and classroom mastery goal structures.

3.2 Multilevel Analyses to Regress Achievement Goals to Individual and Contextual Antecedents

We used the following base model to estimate the effects of the individual and environmental antecedents of achievement goals. This was estimated separately for each of the three types of achievement goals (student *i* in classroom *j*):

Level 1:

$$Goal = \beta_{0j} + \beta_{1j}(implicit\ theory\ of\ own\ abilities) + \beta_{2j}(self\text{-}efficacy) + \beta_{3j}(cognitive\ abilities) + r_{ij}$$

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (*classroom mastery goal structure*) $+ \gamma_{02}$ (*classroom performance goal structure*) $+ u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

On the level of the individual student (level 1), the three individual antecedents were inserted into the multilevel model. The corresponding regression coefficients were modelled as random coefficients which could vary between classrooms in order to test for differences between classrooms regarding the relevance of the individual predictors. On the level of the classrooms (level 2), classroom means of students' perceptions of classroom mastery goal structures and classroom performance goal structures (i.e. estimators of shared perceptions of these classroom goal structures) were inserted into the regression equation as an intercept, i.e. to predict the classroom-specific level of personal achievement goals. The results obtained from an estimation of the multilevel model are displayed in Table 2.

Results from the fixed component of the multilevel model indicated that an incremental theory of own abilities, as well as self-efficacy, function as individual antecedents of the adoption of mastery goals, whereas the former effect was small and the latter was moderate. Moreover, it could be shown that a classroom mastery goal structure functions as a contextual antecedent of mastery goals. Together, individual and contextual predictors explained 33% of the variance of mastery goals. Regarding the individual antecedents of the adoption of performance-approach goals, the model estimation revealed that higher self-efficacy rates and lower cognitive abilities increased the tendency to pursue performance-approach goals.

Altogether, these antecedents explained 14% of the criterion variance. Only 7% of the variance in the performance-avoidance goals could be explained through the individual and contextual predictors in the multilevel model. Specifically, incremental theory of own abilities and cognitive abilities functioned as negative individual predictors and classroom performance goal structure functioned as a positive contextual predictor. The unexpected effects, with regard to direction, which occurred for all three achievement goals in the fixedcomponent of the model should not be ignored (although they are not marked assignificant in Table 2): classroom performance goal structure positively predicted mastery goals, an incremental theory of own abilities positively predicted performance-approach goals and classroom mastery goal structure positively predicted performance-avoidance goals. The last relationship mentioned could be interpreted as an effect of multi-collinearity, since the corresponding bivariate does not differ from nil.

Table 2. Results of Estimating the Multilevel Model (Students Nested in Classrooms)

	Achievement goals		
	Mastery	Performance-approach	Performance-avoidance
Fixed effects			
Intercept	–.01 (0.03)	.00 (0.03)	.00 (0.03)
Level 1 (student)			
Incremental theory of own abilities (γ_{1j})	.17* (0.04)	.09 (0.04)	–.09* (0.04)
Self-efficacy (γ_{2j})	.41* (0.04)	.29* (0.04)	–.04 (0.04)
Cognitive abilities (γ_{3j})	.00 (0.03)	–.06* (0.03)	–.09* (0.03)
Level 2 (classroom)			
Classroom mastery goal structure (γ_{01})	.09* (0.03)	.01 (0.03)	.09 (0.02)
Classroom performance goal structure (γ_{02})	.08 (0.03)	.15* (0.02)	.16* (0.02)
Random parameters			
Level 2			
Residual variance (u_{0k})	.01* (0.02)	.02* (0.02)	.01* (0.01)
Variances of slope coefficients			
Incremental theory of own abilities (u_{1j})	.03* (0.02)	.01 (0.02)	.01 (0.02)
Self-efficacy (u_{2j})	.04* (0.02)	.01 (0.02)	.01 (0.01)
Cognitive abilities (u_{3j})	.00 (0.01)	.00 (0.01)	.01 (0.01)
Level 1			
Residual variance (r_{ik})	.66	.84	.92

Note. N = 1071 students in 41 classrooms. All variables were z-standardized prior to analyses and grand-mean centred – consequently, coefficients and variance components could be interpreted as standardized values, and integers are omitted. Standard errors are presented in brackets. * $p < .05$.

The random component of the multilevel model only yielded significantly varying slopes among the individual antecedents for mastery goals (see Table 2), indicating that the relevance of personal antecedents only varies between classrooms for this type of achievement goal. Specifically, the slopes of implicit theories of own abilities and self-efficacy varied significantly between classrooms.

In order to clarify these varying slopes, we subsequently tested whether a perceived classroom mastery goal structure and a perceived classroom performance goal structure could predict these slopes. In other words, we tested the significance of interactions between individual and environmental antecedents of achievement goals (cf. Dresel, Berner, & Fasching, 2011). Therefore, we included the classrooms means of these goal structures in the mastery goal model equations of the slopes of the individual antecedents (equations for β_{1j}, β_{2j} and

β_{3j}). Estimating this extended multilevel model for mastery goals revealed a significant cross-level interaction between classroom mastery goal structure and self-efficacy (classroom goal structure negatively predicted the slope of self-efficacy; *Coefficient* = –.05; *SE* = 0.03; $p < .05$). No other cross-level interaction could be safeguarded statistically. The significant cross-level interaction represented the buffering effect of a strong classroom goal structure (Figure 1): It weakened the undesirable effect of a low self-efficacy in terms of precluding the adoption of mastery goals. However, students with a strong self-efficacy adopted mastery goals to a large degree, regardless of how strong the classroom mastery goal structure was.

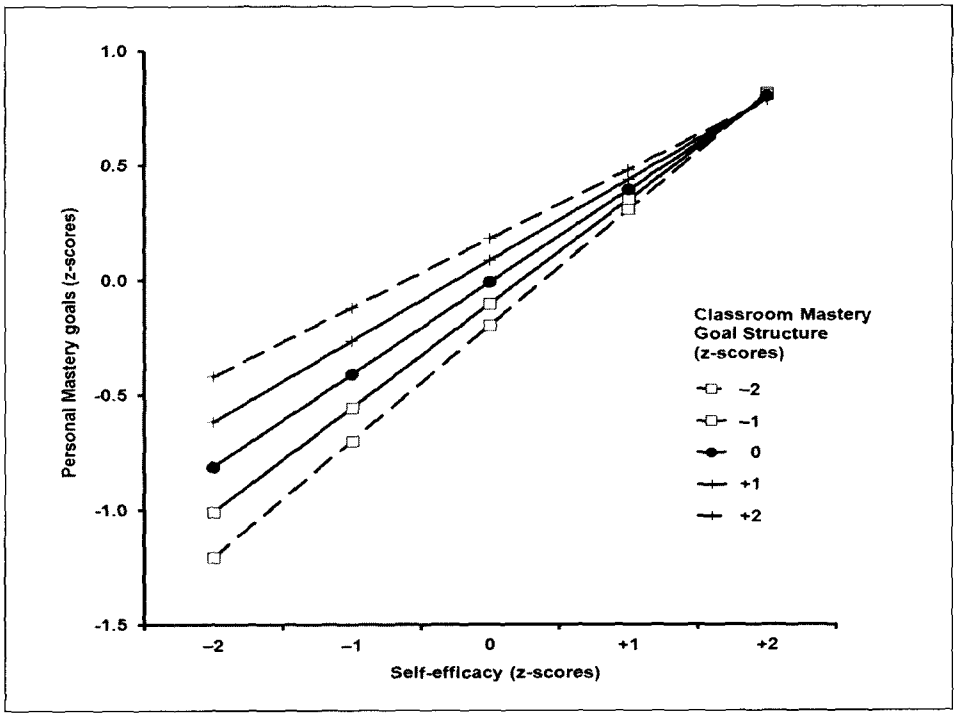

Figure 1. Buffering Effect of a Strong Classroom Mastery Goal Structure Against the Undesirable Effect of Weak Self-efficacy: Cross-level Interaction Between Self-efficacy and Classroom Mastery Goal Structure in Predicting Personal Mastery Goals.

4 Discussion

In the recent editions of the volume "Conceptions of Giftedness" edited by Sternberg and Davidson (2005), as well as in the "International Handbook of Giftedness and Talent" edited by Heller, Moenks, Sternberg, and Subotnik (2000), several theoretical approaches to giftedness and achievement excellence are summarized which view achievement and learning motivation as a crucial factor. This is also true for the Munich Model of Giftedness developed by Kurt

A. Heller (e.g. Heller, 2005; Heller et al., 2005). Among other persons, it is to Kurt A. Heller's merit that giftedness and the development of excellence is conceptualized as a complex interplay of multiple factors, including individual and contextual influences. We picked up on the idea of multi-factorial origins, and analysed both individual and contextual antecedents of achievement goals simultaneously, also taking into consideration interactions between individual and contextual factors. The individual and environmental antecedents we incorporated are considered to be important in the literature. Specifically, we incorporated implicit theories of own abilities (Dweck, 1986; Dweck & Leggett, 1988), self-efficacy (Phillips & Gully, 1997), cognitive abilities (Eison, 1979, 1981) and classroom goal structures (Meece et al., 2006).

4.1 Classroom Goal Structure: Dichotomous vs. Trichotomous Conceptualization?

Regarding the conceptualization of classroom goal structures, the present results support a dichotomous structure which (only) differentiates between a classroom mastery goal structure and a classroom performance goal structure. This is in accordance with previous research in which the separate consideration of a classroom performance-avoidance goal structure was not successful (e.g. Finsterwald et al., 2009; Kaplan et al., 2006). Nevertheless, it stands in contrast to a recent comprehensive analysis which does not utilize the PALS (Midgley et al., 2000), an instrument which supports a trichotomous conceptualization (Schwinger & Stiensmeier-Pelster, in press). One explanation could be measurement issues, i.e. the question of the degree to which different instruments are capable of measuring the three postulated and distinct factors. Clarification on this topic is a relevant and important desideratum for future research, since a great deal of current research relies on the PALS. We propose that whether the distinction between approach and avoidance structures is meaningful on the contextual level should be first clarified from a theoretical perspective. This theoretical clarification should help determine which instructional practices in the classroom could be related specifically and uniquely to performance-approach goal structures vs. performance-avoidance goal structures.

4.2 Individual Antecedents of Achievement Goals

Consistent with previous work, the present results indicate that an incremental theory of one's own abilities and sufficient self-efficacy lead to the adoption of mastery goals in the social context of Mathematics instruction. In contrast to results presented by Eison (1979, 1981) and Payne et al. (2007), in our study cognitive abilities do not have an impact on mastery goals. It could be interpreted that the (bivariate) correlation between cognitive abilities and mastery goals found in previous studies, as well as the present work, may be mediated through self-efficacy and implicit theories. It is well known that cognitive abilities are strongly correlated with school achievement, which in turn is related to

self-efficacy beliefs (see Alexander & Winner, 2006, for an overview). This assumption should be tested in future longitudinal research.

As assumed, performance-approach goals are predicted positively by self-efficacy and (after controlling for the effect of self-efficacy) negatively by cognitive abilities. Unexpectedly, and in contrast to Dweck's theoretical assumptions (e.g. Dweck & Leggett, 1988), an incremental theory of own abilities positively predicted the adoption of a performance-approach goal (although in a weak manner). Since performance-avoidance goals were, in accordance to the theoretical assumptions, negatively predicted by an incremental theory, it may well be the case that the ambivalence of findings associated specifically with the performance-approach component can also be extended to its antecedents (cf. Harackiewicz et al., 2002; Midgley et al., 2001). Apart from the effect by the implicit theory, performance-avoidance goals also depend negatively on student's cognitive abilities, which is in line with some prior findings (Eison, 1979, 1981). Nevertheless, we found that the commonly discussed predictors of achievement goals explained only about 5% of the variance of performance-avoidance goals. Particularly, we found no effect of self-efficacy on the adoption of this clearly maladaptive type of goal. Consequently, more research is needed to explain the processes underlying the adoption of performance-avoidance goals – in contrast to the vast amount of research on their consequences, not very much research exists on this topic (cf. Maehr & Zusho, 2009).

4.3 Contextual Antecedents of Achievement Goals and Their Interaction with Individual Antecedents

Regarding the contextual antecedents of the adoption of certain achievement goals the present analyses revealed, concordant to previous research, that classroom goal structures play a significant role in the goal setting processes of students – also when controlling these influences for the effects of important individual determinants (see Meece et al., 2006, for an overview). Specifically, a strong classroom mastery goal structure fostered the personal adoption of mastery goals and a strong classroom performance goal structure led to the personal adoption of performance-approach and performance-avoidance goals. These effects were of a size known from similar studies (e.g. Finsterwald et al., 2009; Kaplan et al., 2002). These results underpin the important role of classroom instructional practices which develop specific goal structures in order to motivate students to engage in scholastic contexts, and the scope available to teachers to ensure and foster motivated learning. One direction for future research should be to comprehensively and precisely define the instructional practices which lead to certain classroom goal structures (cf. Dresel et al., 2009; Patrick et al., 2001; Turner et al., 2002).

The unexpected positive effect of classroom performance goal structure on the adoption of mastery goals, which cannot justifiably be traced back to statistical artefacts (such as the "positive effect" of classroom mastery goal structure on

performance-avoidance goals), is hard to explain, but not too uncommon. Finsterwald et al. (2009) previously found, in their study with fourth graders, a positive correlation between classroom performance goal structure andpersonal mastery goals. A possible explanation could utilize a multiple goal perspective – maybe a combination of a strong classroom mastery goal structure and a moderate classroom performance goal structure could lead to optimal consequences, at least with respect to mastery and performance-approach goals (cf. Schwinger & Stiensmeier-Pelster, in press).

Presumably, potential interactions between environmental characteristics and individual antecedents of the adoption of achievement goals would be more relevant. It was found that the impact of individual antecedents on the adoption of personal mastery goals can vary from context to context. Specifically, indications for a substantial variation between classrooms were observed for the effects of students' implicit theories of own abilities, as well as self-efficacy, on mastery goals. Moreover, in the present analyses it was found that a strong classroom mastery goal structure, to a certain degree, protects against the undesirable effects of low self-efficacy which – on average – leads to an inhibition of a mastery goal adoption. On the other hand, it could be concluded that a weak classroom mastery goal structure provides the space for the undesired effects of an unfavourable self-efficacy. In other words, a favourable constellation in the learning environment forms a buffer against the maladaptive effects of an unfavourable constellation on the personal level.

Although not all effects of individual predictors varied between classrooms and not all varying effects could be explained, the focus on interactions between individual and contextual antecedents opens up, in our view, a relevant and fruitful perspective regarding the understanding of the processes underlying the setting of adaptive and maladaptive achievement goals which, in turn, are highly relevant for the quality and quantity of learning processes initiated by students. We are convinced that this interactional perspective on achievement goal antecedents has the potential to complement the recently advanced interactional perspective on achievement goal consequences (e.g. Lau & Nie, 2008; Linnebrink, 2005; Murayama & Elliot, 2009). Future research should advance this research perspective, also in order to surmount the limitations of the present study (e.g. non-consideration of the achievement motive, cross-sectional design, no opportunity to control for potential dependencies of the perceptions of the classroom goal structure on individual goal orientations; cf. Lau & Nie, 2008).

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