Learning and Instruction 15 (2005) 87–102

Learning and Instruction

www.elsevier.com/locate/learninstruc

Longitudinal analysis of the link between learning motivation and competence beliefs among elementary school children

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Abstract

The present study examined the link between general school-related learning motivation and competence beliefs in elementary school children. In a cross-sequential design, the populations of four German elementary schools (total $N = 789$) were examined over a two-year period. Children completed self-report questionnaires every six months. Absolute (i.e. mean-level) and relative (i.e. correlational) changes in both variables were examined longitudinally. The results show that learning motivation and competence beliefs decreased over the elementary school years. Children's competence beliefs were moderately to strongly associated with their learning motivation. No evidence for causal determination of learning motivation through ability perception or vice versa was found at any point in time. Results are discussed with regard to practical consequences for teachers and researchers.

Keywords: Learning motivation; Competence beliefs; Elementary school; Longitudinal analysis

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0959-4752/$ - see front matter
doi:10.1016/j.learninstruc.2005.04.008

In times of ever-changing demands of vocation and everyday life, a high motivation to learn is a fundamental requirement. As the main aim of schools is to prepare children for a successful mastery of future challenges, teachers are expected not only to convey knowledge, but also to foster a sustained learning motivation. It is important for teachers to be aware of this necessity and to possess both the knowledge and means with which to enhance students' learning motivation. Many teachers do not feel well prepared for this task due to a lack of professional knowledge about motivation, its development, and strategies for boosting it.

This paper describes results of a project in which a team of researchers and elementary school teachers longitudinally examined the development of learning motivation over the elementary school years. Together, researchers and teachers developed and examined hypotheses about the beginning decline of learning motivation in elementary school, which has been noted in previous research (e.g., Bouffard, Marcoux, Vezeau, & Bordeleau, 2003; Gottfried, Fleming, & Gottfried, 2001; Harter, 1981; Meece & Miller, 2001; Wigfield et al., 1997). The present paper first establishes the term learning motivation, which we consider to be at the core of motivational constructs from different research traditions. Second, we focus on the hypothesis that the decline in learning motivation during the first school years might be causally linked to the parallel decline in pupils' competence beliefs.

1. The concept of learning motivation

Young children seem to have an insatiable desire to learn. The motor for this desire has been described as competence or effectance motivation (Harter, 1978; White, 1959), a kind of motivation that is directed towards and satisfied by a feeling of efficacy (White, 1959, p. 322). From the point of view of effectance motivation theory, individuals do not engage in a task because they want to learn something, but because they want to experience the feeling of efficacy, i.e. they want to feel competent. Since this feeling is only derived from moderately new tasks, individuals are unconsciously directed towards new learning experiences. Therefore, according to this approach, learning progress comes about as a by-product of engaging in enjoyable tasks. Individuals who enjoy tasks that bear potential learning experiences are considered to be motivated to learn. In modern motivation theories, this conception of learning motivation corresponds to the concept of intrinsic motivation (Deci & Ryan, 1985) or interest/intrinsic task values (Wigfield & Eccles, 2000). The concepts of intrinsic motivation and interest converge in the notion that an individual is attracted to a task for reasons that lie within the task itself and that task engagement evokes positive affects regardless of future consequences.

Other theories posit a more conscious desire to learn at the center of learning motivation. In many goal theories, for example, the desire to enlarge one's competencies or to master task demands is conceived of as a consciously represented goal that motivates learning and achievement behavior (e.g., Dweck & Leggett, 1988; Nicholls, 1984). Goal orientation theories describe learning motivation as a conscious striving towards learning progress, the striving for learning, task, or mastery goals.

Although the conceptions of intrinsic motivation and learning goals rest on different theoretical backgrounds and posit different causes for task engagement, there is reason to believe that the two kinds of motivation frequently go hand in hand. Recently, the concepts of intrinsic motivation and learning goals were traced back to a common motivational higher order factor that was named 'learning' and is opposed to a second higher order factor named 'performance' (Marsh et al., 2003). The present paper uses the term learning motivation in the sense of a common motivational factor underlying the conceptions of intrinsic motivation, interest, and learning goals.

2. Development of learning motivation and competence beliefs during elementary school

Several studies have shown a decline of different indicators of learning motivation that begins within the first school years. For example, in a cross-sectional study, Harter (1981) documented age differences in most components of intrinsic motivation, suggesting a steep decline from third to eighth grade. Other studies that investigated intrinsic motivation (e.g., Bouffard et al., 2003; Gottfried et al., 2001) or interest task values (e.g., Wigfield et al., 1997) in elementary school and beyond also reported significant overall decreases, although these developments differ between school subjects and between boys and girls. In the same vein, it was demonstrated that pupils become less oriented towards learning goals with age (e.g., Anderman & Midgley, 1997; Meece & Miller, 2001; Midgley, Anderman, & Hicks, 1995).

Although there is ample evidence of a decline in learning motivation throughout elementary and middle school, the factors underlying this development are not well understood at this time. One assumption that can be derived from effectance motivation theory, and which was held by many teachers in our project, is that learning motivation is connected to children's competence beliefs: Children should be motivated to learn to the extent that they feel competent, i.e. believe in their abilities (White, 1959; see also Bandura, 1993; Eccles & Wigfield, 1995). It is consistently reported that many young children view their abilities very optimistically and that this optimism is not easily shaken in the face of failure (cf. Stipek & MacIver, 1989). Over the course of elementary school and beyond, children form increasingly realistic and therefore in most cases less positive self-perceptions of ability (e.g., Newman, 1984; Stipek & Daniels, 1988; Wigfield et al., 1997). Thus, the general decline in learning motivation over the first school years is paralleled by a decline in competence beliefs. Moreover, several studies indicate a substantial positive association between concurrently measured intrinsic motivation (e.g., Deci & Ryan, 1985; Harter, 1981) or interest values (e.g., Eccles & Wigfield, 1995; Wigfield et al., 1997) and competence beliefs. The largest longitudinal study pertaining to these constructs, the Michigan Childhood and Beyond Longitudinal Project initiated by Eccles and her associates, provided evidence for increasing associations between intrinsic values and competence beliefs from grade 1 to grade 6 (Wigfield et al., 1997). Similarly, Obach (2003) found substantial correlations between pupils' concurrently measured mastery goals and competence beliefs, which became stronger between grade 5 and grade 7.

Surprisingly, few studies have tried to provide evidence for the hypothesized causal link between competence beliefs and learning motivation. In a study with a relatively small sample, Obach (2003) found that pupils' school-related competence beliefs were not predictive of mastery goals one year later when controlling for initial mastery goals. Another longitudinal study, in which the motivational measure encompassed interest/liking and investment in a certain domain, also found no evidence for a causal link between prior competence beliefs and subsequent motivation (Skaalvik & Valas, 1999). In a similar vein, a recent study by Nurmi and Aunola (2005), which focused on intrinsic task values as a motivational measure, found no conclusive evidence for causal determination of intrinsic task values through competence beliefs. Contrary to this, a study using the Michigan Childhood and Beyond Longitudinal Sample (Jacobs et al., 2003) concluded that students' competence beliefs explain substantial variance in the change of values over time. One reason for the diverging results of this latter study might be sought in the motivational measure that the researchers used, which differs markedly from the concept of learning motivation. Whereas learning motivation includes only intrinsic motivation and learning goals, Jacobs et al. used a composite score that combined interest values with importance and utility values, both of which would rather be part of the 'performance' factor of motivation proposed by Marsh et al. (2003). Other than this, we are not aware of any studies that have investigated the possible causal link between school-related competence beliefs and learning motivation in a longitudinal classroom study. Given the scarce and in part inconsistent results of the existing studies, further studies are needed to shed light on the subject.

3. Hypotheses

The present study investigates the extent to which competence beliefs are associated with and determine the learning motivation of elementary school children. Both absolute (i.e. mean-level) and relative (i.e. correlational) changes in the two variables were examined longitudinally. We expected both children's learning motivation and competence beliefs to decline throughout elementary school. Structural equation modeling was applied to test whether models including causal influences from competence beliefs on future learning motivation and vice versa provided a better fit to the data than models that did not assume causal influences.

4. Method

4.1. Participants

The data presented are part of a two-year longitudinal study of motivational prerequisites of learning and achievement behavior (Spinath, 2002). The sample consisted of the populations of four regular German elementary schools (approximately 14% of the parents did not agree to the participation of their children). The schools were located in average school districts in a medium-sized German town and were of average size by German standards (mostly three classes per grade with 19–31 pupils per class).

The following analyses include $N = 789$ pupils for whom complete data sets were available for all five measurement occasions (about 70% of the children whose parents agreed to their participation). Attrition was mainly due to children's absence at one or more measurement occasions (e.g., children being ill, moving away, or leaving the school for other reasons). Comparisons of the mean scores for the variables of interest yielded no significant differences between the cross-sectional and the longitudinal sample.

The participating children were clustered into five cohorts representing different grades at one measurement occasion, and took part in between one (cohort 1) and five (cohorts 3 and 4) measurements (see Table 1). Children were on an average 7.2 years old (SD = 0.4) in grade 1 and 10.3 years old (SD = 0.5) in grade 4. Of the total sample, 55.0% of the children were girls.

4.2. Measures

4.2.1. Competence beliefs

Children's competence beliefs were assessed by means of four items. Each item contained a question about the child's general (i.e. not domain-specific) school-related ability (''How good are you at the things you do in school?'', ''How easy do you find the things you do in school?'', ''How talented do you think you are in the things you do in school?'', ''How quickly do you learn new things in school?''). The questions were answered on a 5-point Likert scale, which was illustrated by graphic symbols depicting the meaning of each possible answer. Teachers had familiarized their classes with these scales to ensure that even the youngest children understood the answering scales. Factor analyses yielded a one-factor solution with a strong general factor explaining 66.7% of the variance. The reliability of the scale, averaged over measurement occasions and grades, was $\alpha = 0.76$.

4.2.2. Learning motivation

Children's learning motivation was assessed by means of four items. Each item contained a question about the child's general (i.e. not domain-specific) school-related learning motivation. Two items assessed learning motivation in the sense of intrinsic school-related motivation (''How much do you like the things you do during classes most of the time?'', ''How much fun are the things you do during classes for you?'') and two items assessed learning motivation in the sense of learning goals (''In school, how important is it for you to learn new things?'', ''In school, how much do you want to really understand new things?''). Again, the questions were answered on a 5-point Likert scale that included graphic symbols. Factor analyses yielded a one-factor solution with a strong general factor explaining 61.3% of the variance. The reliability of the scale, averaged over the measurement occasions and grades, was $\alpha = 0.74$.

Table 1
Means, standard deviations, and ANOVA results for learning motivation and competence beliefs over time

	Grade 1		Grade 2		Grade 3		Grade 4		ANOVA	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	*F* (df)	η^2
Learning motivation										
Cohort 1 ($n = 242$)								4.25 (0.70)	–	–
Cohort 2 ($n = 181$)						4.59 (0.56)	4.37 (0.60)	4.29 (0.56)	53.10*** (1,180)	0.23
Cohort 3 ($n = 129$)				4.75 (0.50)	4.55 (0.49)	4.43 (0.57)	4.41 (0.54)	4.33 (0.58)	65.86*** (1,128)	0.34
Cohort 4 ($n = 122$)		4.68 (0.63)	4.59 (0.57)	4.63 (0.45)	4.60 (0.50)	4.48 (0.56)			7.61** (1,121)	0.06
Cohort 5 ($n = 115$)	4.59 (0.64)	4.48 (0.66)	4.42 (0.67)	4.37 (0.68)					10.63** (1,114)	0.09
Competence beliefs										
Cohort 1 ($n = 242$)								3.77 (0.63)	–	–
Cohort 2 ($n = 181$)						4.18 (0.52)	4.12 (0.51)	4.08 (0.50)	7.66** (1,180)	0.04
Cohort 3 ($n = 129$)				4.27 (0.55)	4.15 (0.58)	4.13 (0.51)	4.10 (0.56)	3.97 (0.58)	25.65*** (1,128)	0.17
Cohort 4 ($n = 122$)		4.53 (0.50)	4.34 (0.56)	4.31 (0.63)	4.19 (0.55)	4.13 (0.62)			37.84*** (1,121)	0.23
Cohort 5 ($n = 115$)	4.55 (0.50)	4.41 (0.63)	4.39 (0.59)	4.24 (0.55)					25.34*** (1,114)	0.18

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

4.3. Procedures

The measurements took place every six months (in Spring and Fall) between 2001 and 2003. Pupils completed the questionnaire during a regular class in their classrooms. The procedure lasted about 20 min and was conducted by teachers who did not teach in this class and were trained to administer the items. All items were read out loud to ensure that pupils all worked at the same speed.

4.4. Analyses

4.4.1. ANOVA

One-way within-subjects analyses of variance (ANOVA) for repeated measurements were used to investigate mean-level changes in learning motivation and competence beliefs over the measurement occasions in each cohort. The effect size η^2 indicates the proportion of variance that can be attributed to the time effect.

4.4.2. Structural equation modeling

Structural equation modeling (SEM) was used to test the fit of two longitudinal models depicted in Fig. 1. Cohorts 2–5 were analyzed separately and the number of measurement variables in the model was adjusted according to the available data in each cohort. Data from cohort 1 was not analyzed because only one measurement was available for this group. Models were fitted to raw data using Mx (Neale, Boker, Xie, & Maes, 1999).

The model depicted in Fig. 1a (Causal Model) allowed for causal paths between the constructs. To identify the model, several constraints were applied, including the equation of autoregression estimates for each construct (a and b), cross-lagged causation from one variable to the other (c and d) and reciprocal causation at each measurement occasion (e and f). This model also allows for the testing of series of nested submodels, i.e. submodels that are completely included in the full model and are fitted by constraining paths from the full model, thus gaining additional degrees of freedom. Typically, a more parsimonious variant is preferred if the reduced model does not lead to a significant deterioration in fit (Neale & Cardon, 1992). Differences in fit between nested models can be tested by means of likelihood ratio tests (LRT). In the model depicted in Fig. 1b (Correlational Model), cross-lagged causal paths were omitted and reciprocal causation at each measurement occasion was replaced by correlations. This model does not assume any causal effect between learning motivation and competence beliefs and it was devised as an alternative to the causal model. Within the correlational model, a variant that fixes the correlations between learning motivation and competence beliefs to be equal across age can be compared to a model that allows these correlations to vary. Because the correlational model is not nested within the causal model, Akaike's Information Criterion (AIC) was used to compare the two models (Akaike, 1987), with more negative AIC values indicating better fit.

Raw data modeling typically yields log-likelihood fit indices (Neale et al., 1999), which are not readily interpretable in terms of the overall fit of a model. Therefore,

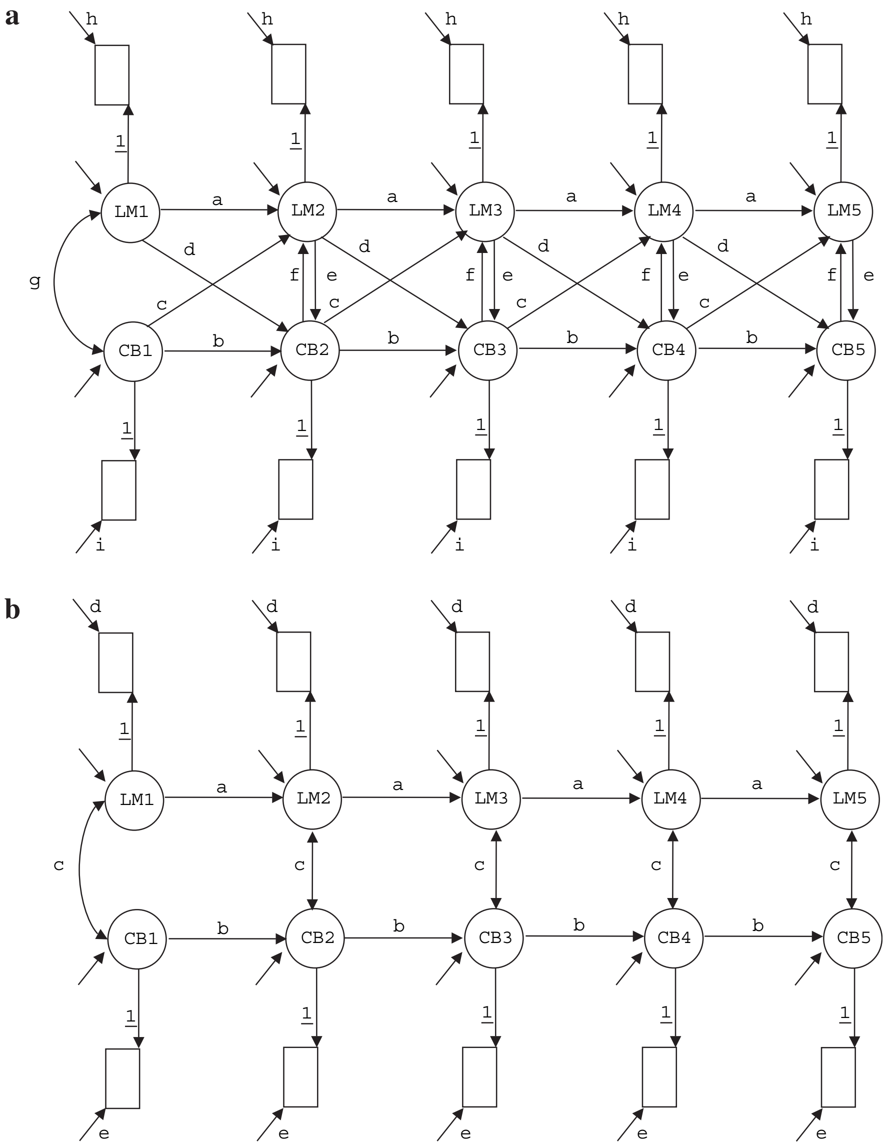

Fig. 1. (a) Causal Model. Longitudinal SEM model of learning motivation (LM) and competence beliefs (CB) including causal paths. Same letters indicate that the parameter estimates are equated. Because models were fitted to raw data, the depicted full variant with five measurements for each construct estimates 29 parameters (9 paths identified by letters a to i + 10 residuals indicated by a single-headed arrow for each latent variable + 10 means). (b) Correlational Model. Longitudinal SEM model of learning motivation (LM) and competence beliefs (CB) without causal paths. Same letters indicate that the parameter estimates are equated. The depicted variant with five measurements for each construct estimates 25 parameters (5 paths identified by letters a to e + 10 residuals indicated by a single-headed arrow for each latent variable + 10 means).

we fitted an additional saturated model to the data from each of our cohorts and compared the fit of the causal and the correlational models to the fit of the saturated model. Goodness-of-fit was assessed using the Bayesian Information Criterion (BIC; Raftery, 1995). This statistic was the preferred index of fit for the current analyses since it provides a test whose preference for parsimony remains stable independent of sample size. The BIC statistic is calculated as

$$\mathrm{BIC} = -2\mathrm{LL} - d\ln(N)$$

where LL is the log-likelihood of the model, d the number of degrees of freedom, and N the sample size. Differences of more than 10 indicate a strong preference for the model with the more negative BIC value.

5. Results

Table 1 depicts the means and standard deviations for learning motivation and competence beliefs for the five cohorts as well as the ANOVA results testing the hypothesized time effect. As expected, both learning motivation and competence beliefs declined with age in each cohort. The effect sizes range from small to moderate. The decline in learning motivation was stronger in the older cohorts and only weak in the two youngest cohorts. This pattern did not recur in children's competence beliefs as here the oldest cohort showed the weakest decline.

In order to investigate whether the data indicated causal effects between competence beliefs and learning motivation, we analyzed the structural equation models depicted in Fig. 1. A comparison of the model fit indices for the full causal and the correlational models reported in Table 2 (columns 1 and 2) showed that the two models yielded virtually identical AIC fit values across cohorts, indicating that the more elaborate causal model did not provide a better fit to the longitudinal data than the correlational model. Reference fit indices from saturated models for model comparisons are presented in column 3. Columns 4 and 5 of Table 2 demonstrate that in three out of four analyses, fixing the correlation between competence beliefs and learning motivation did not deteriorate the fit within the correlational models. Only in the fourth cohort did the model with free correlations provide a somewhat better fit than the model with restricted correlations. The last two columns (7 and 8) of Table 3 show that the overall Goodness-of-fit of the chosen correlational model was satisfactory.

Table 3 reports the predicted correlations for learning motivation and competence beliefs as well as the corresponding path coefficients with 95% confidence intervals. We can observe high temporal stability within learning motivation and competence beliefs (columns 1–7) as well as moderate to high concurrent intercorrelations between the two constructs (column 8). There is some indication that the correlation between learning motivation and competence beliefs was lower in older cohorts. The last two columns of Table 3 report the path coefficients and corresponding confidence intervals. Column 9 shows the temporal stability paths for learning

Table 2
SEM model comparisons: model fit of raw data analyses

	Model fit of raw data analyses							
	−2 log-likelihood; df (AIC)			Free vs. fixed correlations (correlational model)		Chosen model	Overall fit	
	Full causal model	Correlational model	Saturated model	LRT (df)	p		Δ BIC	p
Cohort 2 (n = 181)	1340.06; 1065 (−789.94)	1344.80; 1069 (−793.20)	1335.77; 1059	3.19 (2)	0.20	CORR, fixed	−42.95	n.s.
Cohort 3 (n = 129)	1603.70; 1261 (−918.30)	1611.75; 1265 (−918.25)	1529.16; 1225	7.12 (4)	0.13	CORR, fixed*	−111.80	n.s.
Cohort 4 (n = 122)	1580.53; 1191 (−801.47)	1583.22; 1191 (−798.78)	1504.60; 1155	13.70 (4)	<0.01	CORR, free	−94.70	n.s.
Cohort 5 (n = 115)	1448.27; 895 (−341.73)	1454.09; 899 (−343.91)	1429.07; 876	3.72 (3)	0.29	CORR, fixed	−70.95	n.s.

Note: AIC = Akaike's Information Criterion; LRT = Likelihood Ratio Tests; BIC = Bayesian Information Criterion.

Table 3
Predicted correlations from correlational SEM model and corresponding path coefficients

	Temporal stabilities							Concurrent correlations	Path coefficients (confidence intervals)	
	Grade 1	Grade 1 > Grade 2	Grade 2	Grade 2 > Grade 3	Grade 3	Grade 3 > Grade 4	Grade 4	LM × CB	LM and CB	LM × CB
	Fall > Spring	Spring > Fall	Fall > Spring	Spring > Fall	Fall > Spring	Spring > Fall	Fall > Spring			
Learning motivation										
Cohort 2 (n = 181)						0.80	0.89	0.31	0.84 (0.70–0.98)	0.31 (0.18–0.45)
Cohort 3 (n = 129)			0.83	0.90	0.94	0.92		0.48	0.97 (0.86–1.0)	0.48 (0.33–0.62)
Cohort 4 (n = 122)		0.87	0.78	0.80	0.70			0.53	0.75 (0.64–0.85)	0.53 (averaged)
Cohort 5 (n = 115)	0.78	0.89	0.89					0.77	0.88 (0.72–1.03)	0.77 (0.62–0.90)
Competence beliefs										
Cohort 2 (n = 181)						0.78	0.82		0.76 (0.63–0.80)	
Cohort 3 (n = 129)			0.78	0.86	0.88	0.78			0.83 (0.71–0.93)	
Cohort 4 (n = 122)		0.57	0.69	0.77	0.69				0.72 (0.59–0.83)	
Cohort 5 (n = 115)	0.56	0.88	0.89						0.80 (0.66–0.93)	

Note: LM = learning motivation; CB = competence beliefs; maximum likelihood confidence intervals (95%) are presented for un-scaled path estimates.

motivation and competence beliefs, whereas column 10 includes the path for concurrent measurements of the two constructs.

6. Discussion

One main result of the present study is that children's general school-related learning motivation and competence beliefs decline throughout elementary school. This finding is in line with previous research and adds to our knowledge about developmental trends that seem to be universal across a variety of culturally different classroom contexts (e.g., Anderman & Midgley, 1997; Bouffard et al., 2003; Gottfried et al., 2001; Meece & Miller, 2001; Midgley et al., 1995; Newman, 1984; Stipek & Daniels, 1988; Stipek & MacIver, 1989; Wigfield et al., 1997). A closer look at the evidence of decreasing motivation and competence beliefs reveals that these trends take different courses for boys and girls as well as for different school subjects (e.g., Wigfield et al., 1997), and that the onset of the decline does not always fall within the first two school years (Nurmi & Aunola, 2005). But even in the face of such differences, the overall picture of declining general school-related motivation and competence beliefs throughout elementary school and beyond is very clear. It is therefore particularly important to investigate the processes underlying these changes. A clearer understanding of the corresponding causes and effects will finally help us to understand to what extent the decline in learning motivation and competence beliefs are inevitable developmental phenomena and to what extent they can be influenced by characteristics of the educational setting.

Pertaining to these questions, the second main result of the present study is that no evidence was found for a causal determination of children's learning motivation through their competence beliefs or vice versa. Specifically, the longitudinal development of four cohorts of first to fourth graders was best represented by a statistical model that predicts children's competence beliefs and learning motivation (a) to be substantially stable in terms of interindividual differences, (b) to be moderately to highly intercorrelated with each other, and (c) to have no causal influences on one another. Compared to previous studies, the interindividual stability as well as the concurrent intercorrelations of the two constructs is relatively high in the present study. Correlations of such magnitude are usually found in children at the end of elementary school or at the transition to middle school (e.g., Obach, 2003; Skaalvik & Valas, 1999), whereas in the first years of elementary school these associations tend to be weak to moderate (as reported for the Michigan Childhood and Beyond Study by Wigfield et al., 1997). The higher correlations in the present study could in part be due to the general school-related measures we used in comparison to the domain-specific measures used, for instance, in the Michigan Longitudinal Study. For example, considerable interindividual stability can be observed among children in grades 1 and 2 when looking at motivational patterns across different domains rather than focusing on one domain (Nurmi & Aunola, 2005). A second reason for stronger associations reported in the present study is that the correlations are predictions derived from our statistical model, which tend to be somewhat higher than the first-order correlations.

Although moderate to strong concurrent correlations between learning motivation and competence beliefs might suggest causal influences between the two constructs, the present data provide no evidence for such mechanisms. This is especially important, because many prominent motivation theories include, more or less explicitly, the assumption of causal links between learning motivation and competence beliefs (e.g., Deci & Ryan, 1985; Eccles & Wigfield, 1995; Harter, 1978; White, 1959). The present findings do not rule out the possibility of some causal influences between competence beliefs and learning motivation, but they do indicate that these influences would be rather small. Further studies would benefit from taking a closer look at variables that might either influence both competence beliefs and learning motivation, or function as moderators of the association between the two. For example, the predominance of either a social or an individual norm of reference (Rheinberg, Duscha, & Michels, 1980) might moderate the strength of association between learning motivation and competence beliefs. In a learning environment with a predominant social norm of reference, both competence beliefs and learning motivation rely strongly on perceptions of abilities relative to others. Normative ability feedback, as conveyed by grades, competitions, or simply comparing pupils' achievements with one another, is likely to engender both high competence beliefs and strong feelings of efficacy, i.e. learning motivation, in children with high abilities relative to others, whereas children with low abilities are likely to end up with low competence beliefs and few reasons for feelings of efficacy under such feedback conditions. Opposed to this, in a learning environment with a predominant individual norm of reference, children can experience feelings of efficacy independently of their ability relative to others. Because an individual norm of reference defines success in terms of individual learning progress, all children have the opportunity to feel efficient independently of their ability relative to their classmates. Therefore, competence beliefs and learning motivation should be more closely associated in a learning environment where a social norm of reference prevails compared to settings with a prevailing individual norm of reference. As the emphasis on normative feedback and performance outcomes instead of learning goals usually increases after elementary school (e.g., Midgley et al., 1995; cf. Eccles, Midgley, & Adler, 1984), a causal link between competence beliefs and learning motivation is more likely to be found in middle school than in elementary school.

Moreover, a possible causal relation between competence beliefs and learning motivation might be found for certain domains or tasks. For example, Jacobs et al. (2003) reported that students' competence beliefs in mathematics, language arts, and sports explain substantial variance in the change in domain-specific task values over time. Contrary to this, Skaalvik & Valas (1999) failed to demonstrate causal associations between domain-specific competence beliefs and motivational measures in mathematics and language arts. Such inconsistent results may also in part be due to different methodological approaches, which can be more or less sensitive for detecting causality. Altogether, future studies are needed to investigate domain-specific learning motivation and competence beliefs with different methodological approaches.

Although there is reason to treat any interpretations of the present results with caution until further research has been conducted, it is interesting to take a look at some of the potential inferences to be drawn for teachers and educational settings. Many teachers in our project held the assumption that declining learning motivation was an inevitable consequence of children's increasingly realistic self-perceptions. Some teachers even reported practices meant to preserve these overoptimistic self-perceptions by giving either unrealistically positive or imprecise feedback. In light of the current research findings, teachers should be guided to reconsider their implicit theories about the maintenance and enhancement of pupils' learning motivation and to change their feedback practices. Feedback practices meant to preserve unrealistic self-perception are likely not only to fail to foster children's learning motivation but also to hamper learning progress. Unrealistic or lack of feedback sets children up for future failure experiences. Instead, only if children are able to evaluate their abilities realistically they are able to choose adequate tasks and perceive their own learning progress. This, in return, is likely to foster children's actual abilities and positive self-evaluations.

Nevertheless, even in the face of realistically held low self-perception of ability, learners need the optimism to overcome their shortcomings in order to stay motivated to learn. This optimism can be fostered by an incremental theory of ability, which holds that abilities are not fixed entities but malleable qualities (Dweck & Leggett, 1988), or by an individual-temporal frame of reference, which focuses on personal learning progress rather than social comparison (Rheinberg et al., 1980). An optimistic, motivationally beneficial attitude towards learning is largely independent of the absolute level of ability the individual possesses at a given moment.

7. Conclusion

The present study suggests that the development of learning motivation and competence beliefs over the course of elementary school might not be linked causally. Whereas the development of realistic self-perceptions of ability is an important developmental task for elementary school children, there is no reason why children should become less and less motivated to learn. If the decline of children's learning motivation throughout elementary school and beyond is not an inevitable consequence of declining competence beliefs, then it might be possible to disentangle the developmental curves of the two constructs. We consider this a challenging task for future cooperation of researchers and teachers.

Acknowledgement

The authors would like to thank Dr. Frühling Rijsdijk for helpful advice on raw data analysis.

The data presented are part of a research grant from the German Ministerium für Schule, Wissenschaft und Forschung des Landes Nordrhein-Westfalen to Prof. Dr. Birgit Spinath and Prof. Dr. Uwe Kleinbeck.

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