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Aspects of dynamics in motivation: What the cooperative situation and individual motivation contribute to motivation during computer-supported cooperative learning

Dynamik von Motivation: Der Beitrag der kooperativen Situation und individueller Motivation beim computer-unterstützten kooperativen Lernen

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Abstract

This research sought to look more closely at dynamic aspects of learning motivation. Based on the assumption that motivation is a function of person and situation, we posited the question to what extent several motivational constructs are influenced by a change from an individual to a cooperative learning situation. To this end we used the data from an empirical study on computer-supported cooperative learning involving $N = 200$ university students who initially learned in an individual and afterwards in a cooperative situation. In both phases, different motivation constructs were measured before, during and after learning. Motivational constructs were chosen following an expectancy-value approach to motivation. A structural equation model showed that motivational constructs measured before learning in a cooperative situation were to a large degree predicted by the respective motivation construct measured before learning in the individual situation. Whereas motivation during and after learning was largely predicted by a latent factor for the cooperative situation indicating that motivation constructs that were measured during and after learning were more situation-specific. Several possible explanations for this result are discussed.

Key words: learning, motivation, dynamics, stability, cooperative learning, individual learning, situation, expectancy value model,

Zusammenfassung

Das Ziel der vorliegenden Studie war es, die Dynamik von Lernmotivation näher zu betrachten. Basierend auf der Annahme, dass Motivation eine Funktion von Person und Situation ist, untersuchten wir die Frage, wie stark verschiedene Motivationskonstrukte beeinflusst werden von einer Veränderung einer individuellen hin zu einer kooperativen Lernsituation. In einer empirischen Studie zum computer-unterstützten kooperativen Lernen lernten Studierende ($N=200$) zuerst in einer individuellen und danach in einer kooperativen Situation. In beiden Phasen wurden anlehnend an einen Erwartungs-Wert-Ansatz von Motivation verschiedene Motivationskonstrukte vor, während und nach dem Lernen erhoben. Mittels Strukturgleichungsmodellierung ließ sich zeigen, dass Motivationskonstrukte, die vor dem Lernen in einer kooperativen Situation gemessen wurden, zu einem großen Teil durch das jeweils entsprechende Konstrukt, das vor dem Lernen in der individuellen Situation gemessen wurde, vorhergesagt werden konnten. Dagegen konnte Motivation während und nach dem Lernen zu einem großen Teil durch einen latenten Faktor für die kooperative Situation vorhergesagt werden und war daher situationsspezifischer. Es werden verschiedene Erklärungen für dieses Ergebnis diskutiert.

Schlüsselwörter: Lernen; Motivation; Dynamik; Stabilität; kooperatives Lernen; individuelles Lernen; Situation; Erwartungs-Wert-Modell

Aspects of dynamics in motivation: What the cooperative situation and individual motivation contribute to motivation during computer-supported cooperative learning

1 Introduction

Motivation plays a central role in learning: it influences whether we begin to learn, how long we persist in learning and how we learn. A vast body of research illustrates the importance of motivation for learning and there are several motivational constructs (cf. Murphy & Alexander, 2000) that can be used to measure motivation at different points in time. However, we do not know much about dynamics in motivation: How do different learning situations affect a person's motivation? There are two distinct learning situations we can put the same learners into, namely, individual and cooperative learning, which were then used to investigate the dynamics of motivation. More specifically, our research question was the following: What does the cooperative learning situation contribute to the motivation of a person beyond her motivation in an individual learning situation? In the remainder of this paper, we first describe motivational constructs in educational research and the importance of the interaction of person and situation. Afterwards, we review existing research on dynamics of motivation, before addressing the difference between individual and cooperative learning situations. We conclude by reporting on an exploratory study we have conducted in order to answer this research question.

1.1 Motivational Constructs in Educational Research

“Motivation is the process whereby goal-directed activity is instigated and sustained” (Pintrich & Schunk, 1996, p. 4). As broad as this definition of motivation is the range of constructs that qualify as motivational constructs in educational research (cf. Murphy & Alexander, 2000). Following Pintrich (2003), these constructs can be classified into expectancy components, value components, and affective components of learning motivation. In their respective expectancy-value models, Heckhausen (e.g., 1977) elaborated

the expectancy components, while Eccles and Wigfield (e.g., 2002) focused on the value components. Concerning expectancy components, most of the research investigated the concept of self-efficacy (Bandura, 1997) either separately or in the context of an expectancy-value model (e.g., Eccles & Wigfield, 2002; Heckhausen, 1977; Narciss, 2006). Self-efficacy is defined as the expectation of competently performing necessary actions. The value components are differentiated, following Eccles and Wigfield (e.g., 2002), into attainment value, intrinsic value, utility value, and cost. Attainment value is defined “as the personal importance of doing well on the task” (Eccles & Wigfield, 2002, p. 119). Intrinsic value can be further distinguished into the interest “the person has in the subject” (Eccles & Wigfield, 2002, p. 120; cf. Krapp, 1999) and into “the enjoyment the individual gets from performing the activity” (Eccles & Wigfield, 2002, p. 120). Herein it refers to activity oriented incentives according to Rheinberg (e.g., 1987). One aspect of cost is anxiety or fear of failure which, according to Pintrich (2003), belongs to the affective components of learning motivation.

These constructs are all part of expectancy-value approaches of motivation such as the models of Heckhausen (1977), Eccles and Wigfield (2002) or Narciss (2006). So far, there is no agreed-upon model covering all motivational constructs and therefore expectancy-value approaches form a comparably holistic framework which nevertheless does not include all possible motivation constructs.

1.2 Interaction of Person and Situation in Motivation

Underlying most of the conceptualizations of motivation is – based on Lewin’s (1939) definition that behavior is a function of person and environment – the notion that motivational processes are “interactions between enduring value dispositions [...] and [...] aspects of the perceived situation” (Heckhausen, 1977, p. 284). This is not only true for the distinction between motive and motivation (e.g., Atkinson, 1957) but also for the concept of

interest (e.g., Krapp, 1999), for expectancy-value models (e.g., Narciss, 2006; Rheinberg, Vollmeyer, & Rollett, 2000) and in some regard for the literature of achievement goals (Fryer & Elliot, 2007). Motives are believed to be enduring value dispositions which become motivation or the motivational state when there is a situation that activates them (e.g., Heckhausen, 1977). Concerning interest, there is a quite similar notion: Individual interest is assumed to be a stable disposition of the person, situational interest or interestingness is a characteristic of the classroom or the situation. In a concrete situation, an individual interest might be stimulated to become an actualized individual interest (e.g., Krapp, 1999).

Research on context in learning and motivation draws exactly on this notion of situational dependency (cf. Wosnitza & Beltman, 2012). Wosnitza and Beltman (2012) proposed a heuristic framework for defining the context of learning and motivation. Following them, context can be differentiated along the dimensions perspective, content and level. The *perspective* of context can be divided into an objective context and a subjectively perceived context. The *content* of context consists of physical elements such as resources, books, buildings etc., social elements like peers or family, and formal elements of context which include rules or a curriculum. The *level* of context consists of a microsystem which refers to the level of the person herself, the mesosystem which includes “the interrelation of two or more microsystems” (Wosnitza & Beltman, 2012, p. 181), the exosystem which refers to, e.g., the organizational level, and the macrosystem which covers societal or cultural elements. These dimensions span a space covering 24 different aspects of context, and there has been increasing interest in the research on context during learning from several perspectives (cf. Volet & Järvelä, 2001).

1.3 Research on Dynamics of Motivation

From previous research we can identify the fact that motivation is perceived as changing across situations, at least if the situations are sufficiently different. Research covering the

change of motivation over time can be classified according to their main focus on time (Ainley & Hidi, 2002). There are a lot of studies covering the developmental *macro-perspective* (Ainley & Hidi, 2002) on motivation change in school (e.g. Ainley, 1998; Niemivirta, 2004; Spinath & Spinath, 2005; Wild, Krapp, Schreyer, & Lewalter, 1998). Overall, a consensus exists that learning motivation declines during the years of schooling (Spinath & Spinath, 2005). Another time frame in motivation research is motivation during one single task (Ainley & Hidi, 2002; Niemivirta & Tapola, 2007), also termed a *micro-perspective* (Ainley & Hidi, 2002) on motivation change over time. For example, Niemivirta and Tapola (2007) found changes of self-efficacy but not of interest during a single task. However, neither lines of research focus on motivation in different situations.

There are also studies that look at motivational change in different situations (mid-level perspective, Ainley & Hidi, 2002). Most of these studied a single motivational construct, for example interest (e.g., Ainley, Hidi, & Berndorff, 2002), intrinsic and extrinsic motivation (e.g., Prenzel, Kramer, & Drechsel, 1998) or achievement goal orientations (e.g., Fryer & Elliot, 2007; Muis & Edwards, 2009; Senko & Harackiewicz, 2005) across several similar (e.g., Fryer & Elliot, 2007) or different tasks (e.g., Muis & Edwards, 2009; Senko & Harackiewicz, 2005) during a semester or across different classroom situations within participants (e.g., Prenzel et al., 1998) or between participants (e.g., Senko & Harackiewicz, 2005). All of these studies found that motivation varies across situations, although none of these studies investigated the impact of a situation on motivation during learning.

Additionally, most studies concentrated on only one construct (mostly interest or goal orientation). Studies such as those by Niemivirta and Tapola (2007) or Bong (2005) that studied interest and self-efficacy at the same time, are an exception. In contrast, Van Nuland, Dusseldorp, Martens and Boekaerts (2010) showed that investigating several motivation constructs at the same time is a fruitful approach, and we assume that an expectancy-value

approach to motivation might be a suitable framework for studying several motivation constructs at the same time. Therefore the aim of this study was to identify how a cooperative learning situation contributed to several motivation constructs over an individual learning situation within an expectancy-value framework.

1.4 Individual and Cooperative Learning as Two Distinct Learning Situations

One means of changing the situation is to alter the instructional setting and a common way of achieving this is through the shift from an individual learning situation to a cooperative one which is often done to enhance motivation.

As for the concept of cooperative learning, several distinctions can be made. First of all, there is a distinction between cooperative and collaborative learning. While cooperative learning usually refers to division of work among the learners (Dillenbourg, Baker, Blaye, & O'Malley, 1996; Roschelle & Teasley, 1995), collaborative learning encompasses, following Roschelle and Teasley (1995, p. 70), “a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem”. In recent research on collaborative and cooperative learning, another prominent distinction has been made between co-regulation and socially shared regulation of learning. While co-regulation of learning refers to a group situation where one student takes a role more active and guiding the others (e.g., Schoor & Bannert, 2012; Vauras, Iiskala, Kajamies, Kinnunen, & Lehtinen, 2003; Volet, Summers, & Thurman, 2009), socially shared regulation of learning encompasses “constant monitoring and regulation of joint activity, which cannot be reduced to mere individual activity” (Vauras et al., 2003, p. 35). Therefore, the notion of socially shared regulation is close to Roschelle and Teasley’s (1995) definition of collaboration. Nevertheless, during collaborative and cooperative learning, groups probably experience both self-regulation, co-regulation and socially shared regulation (cf. Grau & Whitebread, 2012).

Following the heuristic framework for context of Wosnitza and Beltman (2012), the change of situation from an individual to a cooperative learning setting can be located in the social content of context. The different distribution of responsibility, which probably also depends on the mode of regulation (co-regulation, socially shared regulation), might influence motivation constructs such as self-efficacy and anxiety. Indeed Nichols (1996) was able to show that compared to traditional instruction cooperative learning enhances self-efficacy.

The hoped for gain in motivation during cooperative learning has been the focus of several studies on the motivational effects of cooperative learning (e.g., Hänze & Berger, 2007; Nichols, 1996; Townsend & Hicks, 1997). From a different perspective, numerous studies have been conducted showing that the basic needs of autonomy, competence and social relatedness mediate the relation between different situational characteristics and motivational variables (for an overview see Lewalter & Scholta, 2009), studies which usually conducted by means of a between-subjects design.

Several recent studies on computer-supported collaborative learning (CSCL) investigated motivation in collaborative settings. A few studies investigated how motivation influences cooperative learning activities during CSCL (e.g., Rienties, Tempelaar, Van den Bossche, Gijsselaers, & Segers, 2009; Schoor & Bannert, 2011). The results indicate that motivation indeed influences the kind of learning activities the learner engages in during cooperative learning. However, these studies provide no insight into the question of how motivation changes across situations.

In contrast research on motivation regulation has shown that there are motivation regulation strategies in group learning settings that are distinct from individual motivation regulation strategies (e.g., Järvelä, Järvenoja, & Veermans, 2008), hinting that a change of social context also includes a change in motivational conditions. Wolters (2011) provides an

overview of motivation regulation across contexts. However, these studies focused on the regulatory activities that groups and individuals engage in to regulate their motivation, and not on motivation per se.

Several other studies show that a cooperative situation is different from an individual situation. For example, Järvelä and Järvenoja (2011) identified challenges in collaborative learning where the main challenge was the commitment of all group members to teamwork which might also result in motivation losses in other group members (cf. Kerr, 1983). Wosnitza and Volet (2009) propose a framework for goals in a collaborative context that acknowledges that in a collaborative setting, multiple goals (performance goals, learning goals, well-being goals) are pursued and goals can be directed towards oneself or towards others.

Summing up the different research areas sketched so far we see motivation as an important educational concept with several constructs. A suitable framework to investigate several constructs at the same time is an expectancy-value approach. Moreover, we understand motivation as an interaction of person variables and the current situation or context. The latter can be defined in relation to several dimensions, one of which is the content dimension with social context as a component. We assume that if the context is changed, a change in motivation should occur. Change in motivation has been researched on several levels: the macro-, micro- and mid-level (Ainley & Hidi, 2002). However, research on the mid-level, which covers change across different situations, has been less common. Finally, a prominent way of changing instructional context is the shift of individual and cooperative learning which refers to a change in the social context.

1.5 The Present Study

All in all, there are several reasons why a cooperative learning situation is motivationally different from an individual learning situation, all other conditions being constant. We can

observe several characteristics of a cooperative learning situation compared to individual learning regarding motivation. First, cooperative learning provides challenges different from the challenges faced during individual learning (Järvelä & Järvenoja, 2011), and which probably imply motivational consequences. Second, cooperative learning – depending on the mode of regulation – includes differences in the responsibility for the own learning process, which may result in motivation changes. Third, learners pursue different goals during cooperative learning (Wosnitza & Volet, 2009), and cooperative learning might stimulate the need for affiliation (e.g., Murray, 1938). Therefore, the group situation might be more motivating and enjoyable for people who are predisposed to this motive. Additionally, the group situation also encompasses a possibility for comparing performances which again might motivate people who are prone to performance avoidance and performance approach goal orientations (cf. Elliot, 1999).

However, research has not been conducted to ascertain to what extent different motivational constructs are influenced by this change of situational background, as thus the present study takes this as its aim. Following Niemivirta and Tapola (2007) we would expect the cooperative situation to contribute to student's self-efficacy while not to interest. Additionally, interest is considered to be a person variable which also speaks in favour of a lower contribution to it of the cooperative situation. Concerning anxiety, we can expect the cooperative situation to contribute to it to a higher degree, either in a positive or negative way, as students might either fear the possible evaluation by their learning partner or appreciate the distributed responsibility.

2 Method

In order to investigate the research question, we used data obtained in the context of another study (Schoor & Bannert, 2011), which analysed the influence of different motivational aspects on learning activities and learning outcome during an individual and a

cooperative phase of computer-supported cooperative learning. Therefore, several motivational constructs of an expectancy-value framework (Narciss, 2006) were measured before, during and after both the individual and the cooperative learning phase. In the present study, some of these data are used to determine the contribution of a cooperative situation to motivation beyond that in an individual learning situation.

2.1 Sample

The participants were 200 university students mainly enrolled in educational science or media communication whose age ranged from 18 to 31 years old ($M = 23.0$, $SD = 2.66$, 65.5% female). Of them, 28 % were first-year students, 18.5% second-year, 14% third-year and 39.5% fourth-year and higher students. They each received a 25 € reimbursement. Due to a technical failure, there were missing data for four participants who we excluded listwise (cf. Graham, 2009, that this procedure is viable for a small percentage of missing data), with the result that the final sample consisted of 196 participants.

2.2 Design and procedure

The students' task was to develop a handout in dyads and the topic of their handout was the test of significance. It had to encompass an outline and main definitions. To this end students received learning texts (paper) as resources and the participants had an initial individual preparation phase (60 minutes) in which time they were to read their learning text and prepare an individual version of the handout before the actual cooperative learning phase (90 minutes) began. The participants were informed before the individual phase that the individual phase served as preparation for the cooperative learning phase (during step 2 in Table 1). Every participant sat in front of an individual computer, and the learning partners of each dyad were located in different rooms. All instructions and questionnaires were presented on the computer screen. Table 1 gives an overview over the procedure followed in the study.

Apart from other measures (demographics, prior knowledge), the participants had to fill in a questionnaire on current motivation at the beginning of the individual phase after having read an extract of the learning text and after the setting of a learning goal. Then, the participants had one hour to individually read their text and prepare the handout. Their motivational state was measured after half way (30 minutes) via a popup which appeared on the computer screen. After this individual phase, motivation after learning (self-evaluation and experienced enjoyment of learning) was assessed. Participants had a short break (about 10-15 minutes) before the cooperative phase began with a test of participants' current motivation relative to the cooperation. Participants then had 90 minutes to jointly develop a common handout via a course management system. After 45 minutes, we again measured their motivational state by means of a popup questionnaire. After the cooperation, motivation after learning (self-evaluation and experienced enjoyment of cooperative learning) was assessed, amongst other measures.

2.3 Material and instruments

Course management system and learning texts. Participants worked on the course management system Moodle (version 1.6) where they had an editor for the individual phase and an editor and a chat for the cooperative phase which they shared with their learning partner. As learning texts we used short introductory texts about the test of significance taken from educational books. Each learning partner of a dyad received a different learning text in order to create distributed knowledge (Hutchins, 1995). Text 1 included two subchapters from Bortz and Döring (2002) while text 2 comprised of one chapter from Sedlmeier and Köhlers (2001). Both learning texts were comparable in length and difficulty.

Motivation questionnaires. Motivation was measured at six points in time: Before, during and after the individual learning phase as well as before, during and after the cooperative learning phase. Before the respective learning phase, self-efficacy, attainment

value, interest, and anxiety were assessed. All items were self-constructed as there was no German instrument available for all these constructs. The motivational state during learning encompassed on-line motivation (Boekaerts, 2002; Vollmeyer & Rheinberg, 2003) and was measured during learning in a popup after half of the individual and cooperative phase. For this measurement, the questionnaire by Vollmeyer and Rheinberg (2003) as well as one additional self-constructed item were used, which covers an affective component, interest, self-efficacy and an implementation-oriented component (Vollmeyer & Rheinberg, 2003). After learning, we additionally assessed the enjoyment experienced during learning as well as a self-evaluational component: satisfaction with one's performance (cf. Heckhausen, 1977). Both scales were self-constructed as there was no German instrument available. For the purpose of the present study, three items per construct were used (see table 2 for the English translation of all the items used).

All items except self-efficacy were rated on a 7-point Likert scale (1-7) with the endpoints "totally agree" (7) and "totally disagree" (1). Self-efficacy items were rated on a 11-point Likert scale (0-10) with the endpoints "I'm sure I'm able to do that" (10) and "I'm sure I'm not able to do that" (0) and transformed to 1-7 before the analysis. All scales (except online-motivation and interest) were constructed in a situation-specific way. While using the same item stem, the concrete activity referred to was adjusted to the individual or cooperative situation.

In confirmatory factor analyses, the measurement models for the individual and cooperative situation showed an acceptable fit (individual situation: RMSEA = .07; $\chi^2 = 332.05$; $df = 168$; $p < .001$; CFI = .94; cooperative situation: RMSEA = .07; $\chi^2 = 347.04$; $df = 168$; $p < .001$; CFI = .94). Tables 3 and 4 show the intercorrelations of the motivation constructs in the individual and cooperative situation. The descriptive characteristics of the scales used are depicted in table 5. All internal consistencies were at least acceptable ($.77 < \alpha$

< .95). Mainly, the means were in the middle of the scale range with some deviance to the upper scale for attainment value or satisfaction and enjoyment of the cooperative phase.

3 Results

In order to determine the contribution of the cooperative situation to the motivational constructs beyond motivation in an individual learning situation, we built a structural equation model (cf. figure 1). We modelled each motivation construct of the cooperative phase as predicted by its counterpart in the individual situation, by a latent situation variable for the cooperative situation, and by an error term. The situation variable was the same for each motivation construct in the cooperative phase. The error term was specified for each motivation construct. All motivation constructs for the individual as well as for the cooperative learning phase were included in the model as latent variables. Each was identified by three manifest variables and all motivation constructs during the individual phase (variable names ending on “1” in figure 1) were correlated with each other in order to account for shared variance of the constructs not caused by the cooperative situation. For example, self-efficacy for the cooperative learning phase was assumed to be predicted by self-efficacy for the individual phase, the latent situation variable of the cooperative situation, and a specific error term. Therefore, the latent cooperative situation variable referred to the joint variance of all motivation constructs during the cooperative situation while they were predicted by their respective counterpart. Figure 1 shows the structural equation model.

The structural equation modelling was carried out using AMOS 17 and verified by a bootstrap of 4000 samples. The resulting model had an acceptable fit (RMSEA = .07; $\chi^2 = 1447.42$; $df = 784$; $p < .001$; CFI = .90). In table 6, the intercorrelations of the latent variables for the individual phase in this model are listed. Figure 2 shows the results concerning both the path coefficients predicting motivation for the cooperative phase from

the individual phase and the weights for the latent variable cooperative situation. The amount of variance explained by the cooperative situation was especially high for all motivational constructs assessed during or after learning (on-line motivation, satisfaction, enjoyment), while the amount of variance explained by the previously measured individual phase variable was 88% for the variable of interest. Interestingly, anxiety was not at all predicted by the cooperative situation. Self-efficacy and attainment value in the cooperative situation were predicted to a larger degree by their counterparts of the individual situation than by the latent cooperative situation variable. These results did not substantially change when a correlation of error terms was included for items that were exactly the same at both measurement points.

4 Discussion

The aim of this study was to explore to what extent a cooperative learning situation contributed to several motivational constructs beyond motivation in an individual situation. This was done by predicting motivation in a cooperative situation using variables that referred to the same motivation constructs but in an individual situation and by an additional latent cooperative situation variable. The results showed that motivation constructs measured before learning (self-efficacy, interest, attainment value and anxiety) were to a large extent predicted by the respective variable measured before the individual learning situation, while motivational variables during and after learning were largely predicted by the cooperative situation. While we expected this kind of result for interest and enjoyment, the results concerning anxiety were surprising.

As the change in the situation did not encompass a change of the learning topic, it is not surprising that interest in the topic also did not change, and that it is thereby largely predicted by interest measured before the individual situation. Nevertheless, this means for the instructional practice that merely incorporating cooperative learning into the classroom

will not immediately change interest. This is, however, in line with models of interest development (e.g., Hidi & Renninger, 2006). According to Hidi and Renninger (2006), the first stages of developing interest involve situational interest that only in later developmental phases becomes individual interest. In our study, we did not measure situational interest but actualized personal interest in the topic (cf. Krapp, 1999). It can be hypothesized that measuring actualized situational interest probably would have resulted in a greater change of interest.

It is interesting that anxiety was so little predicted by the cooperative situation variable. At first sight, this is an astonishing result as one would expect that fear of failure in a cooperative situation is much more dependent on whether the learning partner is seen as a resource (helping against this fear) or as a source of evaluation (which might aggravate this fear). Apparently, this was not encompassed in the cooperative situation variable. In order to grasp these different interpretations of a cooperative situation, other variables are probably needed. Another reason for this interesting result might be that the cooperative situation was stated only subtly in the items of anxiety before the cooperation (“joint” handout, “under pressure” in front of the learning partner, etc.). Maybe a more explicit reference to the learning partner or the cooperative situation would lead to different results. Another interpretation of this surprising result concerns the learning topic ‘statistics’. Perhaps the items measured a kind of statistics anxiety¹ (e.g., Zeidner, 1991) which might be stable across the situations as the topic did not change.

It is interesting that motivational constructs to which the cooperative learning situation contributed less were those constructs that were measured before learning in contrast to constructs measured during or after learning. Therefore, another possible explanation for the results is that motivation after learning is influenced more by the *learning episode*

¹ We want to thank an anonymous reviewer for this idea.

immediately before the measurement, while motivation before learning might be influenced more by *general beliefs* about one's own motivation. This might be because the context of measurement during and after a learning episode is different from other learning episodes as the episode itself provides information and therefore variance, while the context of measurement before a learning episode is – with respect to the learning episode – always the same (cf. Turner & Patrick, 2008), or in other words, it occurs just before a learning episode, when there is only a vague idea of the design and the content of the episode. However, this same context of not knowing does not result from not being able to judge the situation: Before the individual phase, the participants received a part of the learning text, and before the cooperative phase, the participants received their task in order to be able to judge the situations.

All in all, this study also supports the value of using several motivational constructs to measure motivation (cf. Van Nuland et al., 2010). Our results show that a shift in the social context from an individual to a cooperative learning situation contributes to the different motivational constructs in a different way. While there was a high contribution to enjoyment, satisfaction and on-line motivation, there was only little to no contribution to interest and anxiety. These results seem to support the notion that a change of social context to cooperation can enhance (or at least influence) enjoyment of learning. They also support the concept of interest as a rather stable variable. Thus, motivational constructs can be seen as made up of person and situation, but in one specific situation different motivational constructs are differently influenced by the situation.

There are some limitations to this study. First, it was not possible to use identical motivation items for both measurement points. This was due to the approach of adjusting the motivation items directly to the performed activity in order to assess the motivational state of the learners. However, we used a similar item stem within each construct so that the latent

construct would be the same. Additionally, the fit of the resulting structural equation model was only acceptable. It seems that there could also be another model that describes the data better. However, with only two distinct situations (and therefore measurement points) there are limitations in the possible modelling approaches. Yet, including more than two situations into this study would have overwhelmed the participants. In order to study this, we need shorter learning situations which – additionally - are still ecologically valid. Moreover, the participants in our study knew that there would be a cooperative phase following the individual phase and that they were preparing for this second phase. Therefore, the individual phase might not be a typical individual situation as they already expected to have to explain everything to their group partner (cf. Bargh & Schul, 1980). One might also argue that the distinction between measurements before and during learning are somewhat questionable for the individual phase, as the participants got a part of the learning text before they filled in the first motivation questionnaire. However, it was only a short part of the learning text and the participants did not really start working, because they only later received their tools for working on the learning management system. This part of the text was needed to ensure an adequate judgment of the learning situation by the participants. Another limitation of our study is that this was only a variation of one specific aspect of context: the social context. It is possible that the results regarding stability and change of motivation across contexts is not generalizable to other changes of context.

For research on motivation in educational settings, the present results indicate the importance of the measurement point of motivation. Measuring motivation *before* learning might evoke more stable (and maybe more general) beliefs about one's own motivation. Measuring motivation *after* learning, in contrast, might be influenced more strongly by the previous learning episode. Perhaps measuring the motivational state *during* the learning episode might be a viable solution, which we realised by the measurement of on-line

motivation. However, this kind of measurement brings up other difficulties such as disturbing or disrupting learning processes.

An open question remains regarding how micro-, mid- and macro-levels of change (Ainley & Hidi, 2002) relate to each other. The present findings refer to the mid-level of change. It is unclear how it is related to changes on the micro- and macro-level. Ideally, micro-level change of motivation should influence mid-level changes of motivation which in turn should result in changes on the macro-level – and perhaps vice versa. Whether this is indeed the case would involve a different longitudinal research project.

All in all, the present study provides us with interesting initial results into the influence of cooperative situations compared to individual learning on motivation. In a subsequent step, the differential influence that the situation had on different motivation constructs should be further analysed as such an analysis would help researchers not only investigate the dynamics of motivation during learning leading to more specific theoretical models, but also to decide when to measure motivational constructs in learning contexts.

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Table 1. Procedure of the Study.

Individual Phase	Collaborative Phase
1. Pretests + Instruction	6. Instruction for collaborative phase
2. Extract of learning text, setting of a learning goal	7. Questionnaire on current motivation: Self-efficacy, interest, attainment value, anxiety (all in relation to the collaborative phase)
3. Questionnaire on current motivation: Self-efficacy, interest, attainment value, anxiety (all in relation to the individual phase)	8. Collaborative learning: Creating a common handout (90
4. Individual preparing: reading text, creating individual handout (60 minutes). Assessment of motivational state (after 30 minutes)	minutes). Assessment of motivational state (after 45 minutes)
5. Questionnaire on motivation after learning: Self-evaluation, enjoyment of learning (both relating to the individual phase)	9. Questionnaire on motivation after learning: Self-evaluation, enjoyment of learning (both relating to the collaborative phase)
Break (10-15 minutes)	

Table 2. Motivational Scales for the Individual and Collaborative Phase.

Individual Phase	Collaborative Phase
Self-efficacy	
I think I'm able to gather the text in such a way that I can explain the main points to others.	I think I'm able to impart on-line my knowledge of the test of significance to my learning partner.
I think I'm able to understand by means of the text how a test of significance works.	I think I'm able to resolve questions of understanding concerning the test of significance with my learning partner by means of a chat.
I think I'm able to prepare myself by means of the text for the joint development of a handout.	I think I'm able to contribute to our understanding of the test of significance.
Attainment Value	
Providing handouts as good as possible is important to me.	It is important to me that we reach the learning objective of the handout.
I'm intent on developing a handout as good as possible.	Handing in a good handout is important to me.
I'm intent on learning as much as possible from this text.	I'm intent on performing as good as possible in the final test.
Interest	

I find the topic “test of significance” very fascinating.

I find the topic “test of significance” very attractive.

I find the topic “test of significance” very boring. (r)

I find the topic “test of significance” very fascinating.

I find the topic “test of significance” very attractive.

I find the topic “test of significance” not interesting at all. (r)

Anxiety

When I think about the development of the handout, I’m a little concerned.

I’m worried that I won’t understand the text.

When I think about the learning objective, I’m a little concerned.

When I think about the development of a joint handout, I’m a little concerned.

I’m worried that I won’t reach the learning objective.

I feel under pressure to develop a good handout.

On-line Motivation

The task is fun.

What I do at the moment is very interesting.

I’m sure that I’ll find the correct solution.

The task is fun.

What I do at the moment is very interesting.

I know how to proceed.

Satisfaction

I’m very satisfied with my handout.

I think my handout is very well done.

I’m very satisfied with our joint handout.

I think our joint handout is very well done.

I'm very satisfied with my performance.

I'm very satisfied with my performance.

Enjoyment

The development of the handout was very interesting.

The joint development of the handout was very interesting.

Reading the text was very fascinating.

The joint work was very fascinating.

Gathering the text was very much fun.

The collaborative learning was very much fun.

Note. All items except self-efficacy were rated on a 7-point Likert scale (1-7) with the endpoints “totally agree” (7) and “totally disagree (1). Self-efficacy items were rated on a 11-point Likert scale (0-10) with the endpoints “I’m sure I’m able to do that” (10) and “I’m sure I’m not able to do that” (0) and transformed to 1-7 before the analysis. (r) refers to recoded items.

Table 3. Intercorrelations of Motivation Constructs in a Confirmatory Factor Analysis for the Individual Phase

	1.	2.	3.	4.	5.	6.
1. Self-efficacy 1						
2. Attainment value 1	.21**					
3. Interest 1	.18*	.19*				
4. Anxiety 1	-.47***	.12	-.13			
5. Motivation on-line 1	.18*	.35***	.57***	-.10		
6. Satisfaction 1	.21**	.06	.03	-.27***	.21**	
7. Enjoyment 1	.17*	.37***	.71***	-.07	.80***	.23**

Note. All correlations are verified by a bootstrap. The number “1” in the variable name signifies that it is referring to the individual phase.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 4. Intercorrelations of Motivation Constructs in a Confirmatory Factor Analysis for the Collaborative Phase.

	1.	2.	3.	4.	5.	6.
1. Self-efficacy 2						
2. Attainment value 2	.42***					
3. Interest 2	.37***	.30***				
4. Anxiety 2	-.38***	.40***	-.02			
5. Motivation on-line 2	.36***	.40***	.39***	.02		
6. Satisfaction 2	.34***	.43***	.12	-.11	.41***	
7. Enjoyment 2	.34***	.39***	.14	.02	.60***	.57***

Note. All correlations are verified by a bootstrap. The number “2” in the variable name signifies that it is referring to the collaborative phase.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 5. Descriptive Statistics of the Used Scales.

	Individual Phase			Collaborative Phase		
	α	M	(SD)	α	M	(SD)
Self-efficacy	.95	4.79	(1.06)	.92	4.22	(1.27)
Attainment value	.78	5.57	(0.93)	.91	4.90	(1.35)
Interest	.88	3.11	(1.37)	.88	3.03	(1.44)
Anxiety	.92	3.94	(1.57)	.88	3.83	(1.57)
On-line Motivation	.77	3.77	(1.18)	.83	4.16	(1.38)
Satisfaction	.93	3.28	(1.34)	.85	4.94	(1.25)
Enjoyment	.84	3.09	(1.20)	.93	4.65	(1.44)

Note. All items except self-efficacy were rated on a 7-point Likert scale with the endpoints “totally agree” (7) and “totally disagree (1). Self-efficacy items were rated on a 11-point Likert scale with the endpoints “I’m sure I’m able to do that” (10) and “I’m sure I’m not able to do that” (0) and transformed to 1-7 before the analysis.

Table 6. Intercorrelations of Motivation Constructs for the Individual Phase found in the structural equation model.

	1.	2.	3.	4.	5.	6.
1. Self-efficacy 1						
2. Attainment value 1	.24**					
3. Interest 1	.19*	.25**				
4. Anxiety 1	-.47**	.18	-.14			
5. Motivation on-line 1	.19*	.37***	.62***	-.10		
6. Satisfaction 1	.21**	.05	.06	-.29**	.22*	
7. Enjoyment 1	.18*	.40***	.79***	-.06	.80***	.21*

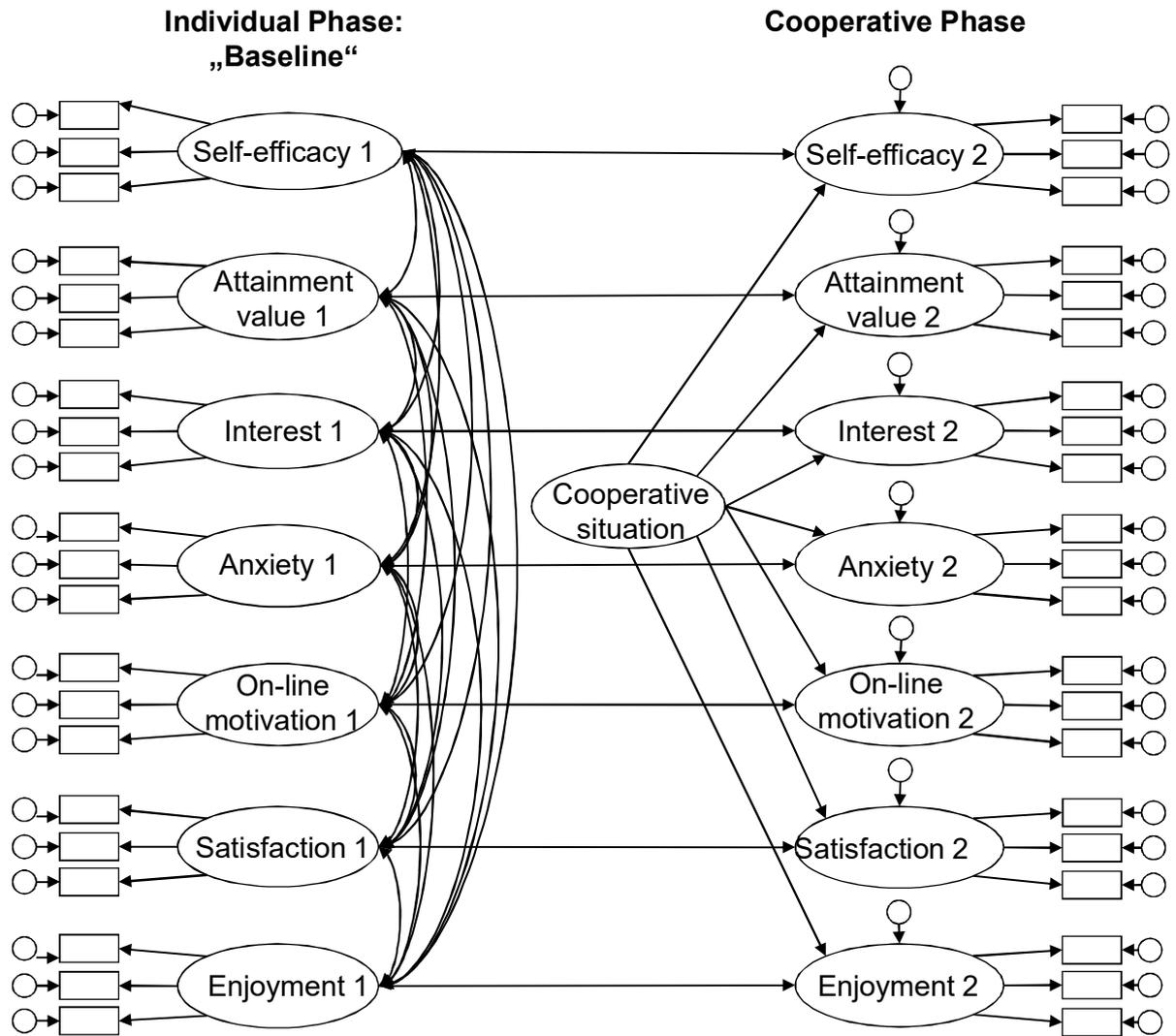
Note. All correlations are verified by a bootstrap. The number “1” in the variable name signifies that it is referring to the individual phase.

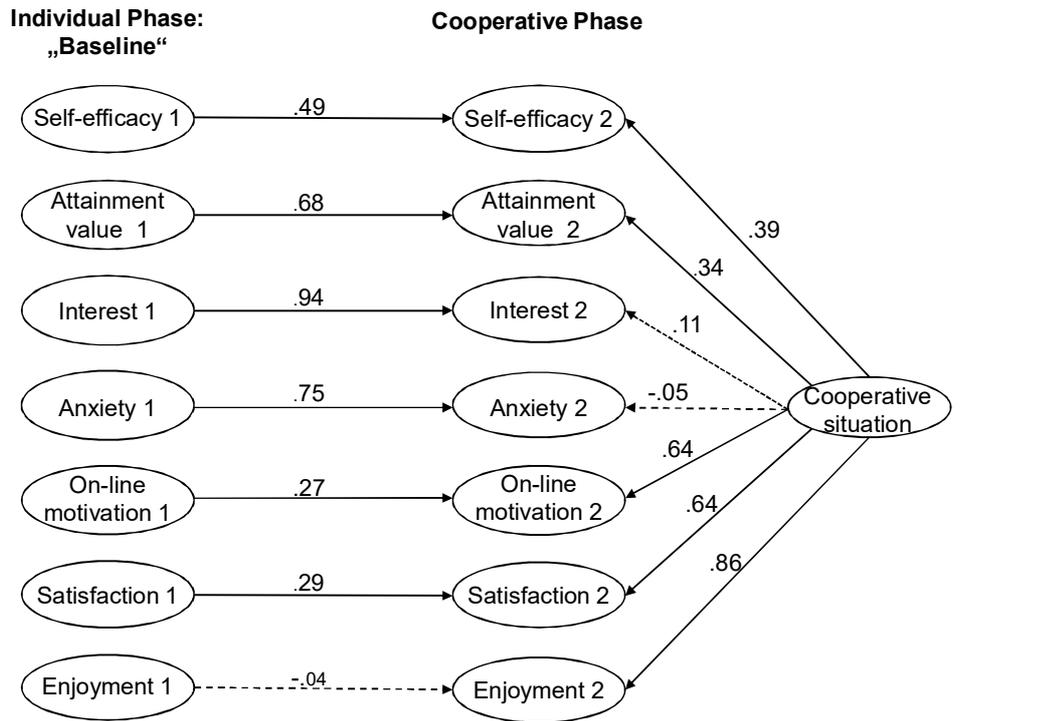
* $p < .05$; ** $p < .01$; *** $p < .001$

Figure Captions

Figure 1. Specified Structural Equation Model.

Figure 2. Main Results of Structural Equation Model.





Note. Each motivation construct was measured by 3 manifest variables. All motivation constructs during the individual phase (variable names ending on "1") were correlated with each other. Each motivation construct during the cooperative phase (variable names ending on "2") had an additional error term as predictor.

RMSEA = .066; $\chi^2 = 1447.42$; $df = 784$; $p < .001$; CFI = .90; NFI = .81.

—→ Significant path
 - - - - -→ Significant path but not in bootstrap
→ Non-significant path