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Motivation in a computer-supported collaborative learning scenario and its impact on learning activities and knowledge acquisition

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Abstract

Addressing a drawback in current research on computer-supported collaborative learning (CSCL), this study investigated the influence of motivation on learning activities and knowledge acquisition during CSCL. Participants' ($N = 200$ university students) task was to develop a handout for which they had first an individual preparing phase followed by a computer-supported collaborative learning phase immediately afterwards. It was hypothesized that in both phases current motivation (in terms of expectancy and value components) influences both learning activities and knowledge acquisition in a positive way. According to main results, only goal orientations (before learning) were associated with knowledge acquisition respectively observed learning activities during the collaborative phase. Expectancy and value components of current motivation related neither to observed learning activities nor to knowledge acquisition during collaborative learning but were in part associated with learning activities and knowledge acquisition during individual learning. The discussion addresses several possible explanations for these unexpected results.

Keywords: Motivation; Collaborative learning; Computer-supported learning; Learning activities; Knowledge acquisition

1. Introduction

When appropriately implemented, collaboration can foster learning by generating "understanding and problem-solving strategies that no group member had prior to collaboration" (Webb & Palincsar, 1996, p. 847). These benefits can even be enhanced in computer-supported collaborative learning (CSCL) scenarios with computer-mediated communication. In computer-mediated communication, collaborative knowledge construction can benefit, for example, from lasting external representations of utterances as provided by e.g., chat tools (Weinberger, 2003) or from the anonymity in communication (e.g., Ainsworth et al., 2011). However, collaborative and computer-supported collaborative learning are not per se beneficial. Therefore, current research on CSCL examines how to support learners by, for example, scaffolding their interaction (e.g., De Wever, Van Keer, Schellens, & Valcke, 2010; Mäkitalo-Siegl, Kohnle, & Fischer, 2011). In that, CSCL research has so far focused on cognitive aspects while motivational aspects have been widely disregarded. However, there is reasonable evidence that motivation plays a mentionable role also in CSCL settings (e.g., Astleitner, 2000). Therefore, it is our aim to explore how motivation influences computer-supported collaborative learning.

Following Murphy and Alexander (2000), there exist 20 different motivational terms. We possess a large body of research from different traditions showing that motivation plays an important role for individual learning (e.g., Del Favero, Boscolo, Vidotto, & Vicentini, 2007; Elliot, McGregor, & Gable, 1999; Pajares, 1996). However, as learning is, especially in the case of computer-supported collaborative learning, a complex process, assessing only a single motivation construct might not go far enough (Moos & Marroquin, 2010; Murphy & Alexander, 2000). A selective view of motivation like this

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might not be able to reflect all relevant relations of motivation with learning processes (Murphy & Alexander, 2000). In contrast, a more holistic, integrative view like, for example, realized in the approaches by Eccles and Wigfield (2002), Narciss (2006), or Pintrich (2003), might provide us with insights about the differential relationship of different motivation constructs with learning processes. This is the more important since research on motivation influences on CSCL is rare and inconsistent, as the next paragraph will show.

1.1. Impact of motivation on computer-supported collaborative learning

So far, only a few studies have approached motivation as an independent variable during CSCL (Bartholomé, Stahl, Pieschl, & Bromme, 2006; Hakkarainen, Lipponen, Järvelä, & Niemivirta, 1999; Howley, Chaudhuri, Kumar, & Rosé, 2009; Nokelainen, Miettinen, Kurhila, Floréen, & Tirri, 2005; Sins, Van Joolingen, Savelsbergh, & Van Hout-Wolters, 2008; Wang & Lin, 2007; Wolf & Prasser, 2006). Among them, we found only one study (Nokelainen et al., 2005) that used an integrative view of motivation, other studies either concentrating on one particular motivational construct like self-efficacy (e.g., Wang & Lin, 2007) or goal orientations (e.g., Hakkarainen et al., 1999) or taking a pragmatic view on motivation using the most promising constructs (e.g., Bartholomé et al., 2006). Nokelainen et al. (2005) assessed asynchronous collaboration in newsgroups on a task for which students had 2 weeks to complete it. The authors found positive effects of motivation on activity in the CSCL system and on the final course grade. However, they assessed the motivational constructs with only 1 item each.

Positive effects of motivation were also shown by other authors. Sins et al. (2008) found positive effects of mastery goal orientation on performance in a CSCL system. Wang and Lin's (2007) assessment of group composition concerning self-efficacy uncovered that dyads with homogenously high self-efficacy showed more high-level cognitive skills which in turn influenced learning outcome. Bartholomé et al.'s (2006) study in contrast indicated that only within the dyad heterogeneously distributed self-efficacy led to more help seeking behaviour and better performance while they found no effect for goal orientations or interest. Hakkarainen et al. (1999) again confirmed a relation of goal orientations with the number of explanation seeking research questions the students formulated but not with performance. In addition to these at least in part positive results, there are also studies that found no effect of motivation on CSCL. Howley et al. (2009) discovered no effect of goal orientations on performance and only marginal effects on substantive contributions to the problem solving. Wolf and Prasser (2006) also could not show an effect of interest, self-efficacy or achievement motivation on learning activities and performance in an online university seminar. Aside from the researched motivation constructs and the results, the learning scenario also varied in these studies from synchronous to asynchronous collaboration and between 5 h and 4 university course sessions.

Apart from CSCL research, research on *collaborative learning in face-to-face settings* might also provide us with information what to expect for a CSCL scenario. Research in this area led to results quite similar to the ones in the context of CSCL, e.g., collaborative learning leads to greater skills acquisition for less self-efficacious participants than for more self-efficacious participants (Day et al., 2007), effective groups in collaborative learning tend to strive for mastery goals whereas not effective groups tend to strive for performance and entertainment goals (Hijzen, Boekaerts, & Vedder, 2007) and mastery goal orientation and performance goal orientation correlate negatively with high-level elaborations and performance (Veenman, Denessen, van den Akker, & van der Rijt, 2005). Again, also in this offline context, studies seldom take an integrative view of motivation, and again, their results are quite heterogeneous.

Research on *learning with computers* (without collaboration) might also turn out useful for the research of motivation during CSCL. In this context, there is much more research on the impact of motivation (for a review see Moos & Marroquin, 2010). However, as this is a completely different learning scenario, learning activities and problems the students encounter and that such studies address are quite different from the collaborative setting. For example, emergent topics are the relation of interestingness and seductive details or relations of motivation with navigational patterns (c.f. Moos & Marroquin, 2010). Research on distance learning on the other hand indicates the importance of motivation in this context. For example, we know of higher drop-out rates in online distance education courses (Astleitner, 2000). Lack of motivation might be the cause for these results. On a more general plate, we can learn both from research on learning with computers and on learning in general that motivation in different facets plays an important role. Interest, for example, is associated with deeper learning and better learning outcome (e.g., Ainley, Hidi, & Berndorff, 2002) as are self-efficacy (c.f. Pajares, 1996) or mastery goal orientations (e.g., Elliot et al., 1999).

There are many studies on the impact of (computer-supported) collaborative learning on motivation (e.g., Järvelä, Järvenoja, & Veermans, 2008). However, as in this case motivation serves as dependent variable, this kind of research (as interesting and important it is) is not in the focus of this paper as we want to focus on motivation as *in*dependent variable.

To sum up: The few studies explicitly addressing the influence of motivation on CSCL mainly use single concepts of motivation instead of an integrative view which in turn is indicated to cover the complexity of learning (Moos & Marroquin, 2010; Murphy & Alexander, 2000). The settings are quite different ranging from long-term asynchronous to short-term synchronous scenarios. The results of the studies concerning the influence of motivation on learning activities and learning outcomes are also quite heterogeneous and sometimes contradicting (Bartholomé et al., 2006; Wang & Lin, 2007). From research on distance education (e.g., Astleitner, 2000) we got hints that motivation might play an important role in this context. Studies covering collaborative learning