

Group awareness and self-presentation in computer-supported information exchange

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Abstract A common challenge in many situations of computer-supported collaborative learning is increasing the willingness of those involved to share their knowledge with other group members. As a prototypical situation of computer-supported information exchange, a shared-database setting was chosen for the current study. This information-exchange situation represented a social dilemma: while the contribution of information to a shared database induced costs and provided no benefit for the individual, the entire group suffered when all members decided to withhold information. In order to alleviate the information-exchange dilemma, a group-awareness tool was employed. It was hypothesized that participants would use group awareness for self-presentational purposes. For the examination of this assumption, the personality variable ‘protective self-presentation’ (PSP) was measured. An interaction effect of group awareness and PSP was found: when an awareness tool provided information concerning the contribution behavior of each individual, this tool was used as a self-presentation opportunity. In order to understand this effect in more detail, single items of the PSP-scale were analyzed.

Keywords Group awareness · Self-presentation · Information-exchange dilemma

Introduction

A crucial prerequisite for nearly all settings of computer-supported collaborative learning (CSCL) is the willingness of the involved people to share their knowledge and the information they possess. If those involved refuse to share their knowledge with the other

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members of a team of learners or collaborators, computer-mediated team work is much less efficient than it could be. Indeed, benefiting from others' knowledge by reciprocally exchanging information is the very option open to team members that makes collaborative team work efficient (Hinds and Kiesler 2002). From the perspective of CSCL it is of particular interest and relevance to analyze ways in which information exchange between team members interacting via computers can be supported (Olson and Olson 2003). This holds true for a multitude of CSCL situations from shared databases (Kali 2006) to chat communication (Fuks et al. 2006) and forum discussions (van der Pol et al. 2006).

The establishment of a shared database is one possibility when it comes to making individual team members' knowledge available to the whole group. Such a shared database enables each group member to enter information into and retrieve information from the database (Jian and Jeffres 2006). Technically speaking, the implementation of a shared database is quite simple. Practically speaking, however, many problems tend to arise: many studies report low motivation of team members in entering information into the database and thus making it available to their group mates (Ardichvili et al. 2003; Argote and Ingram 2000; Huber 2001; Orlikowski 1993; Yuan et al. 2005).

One important explanation for this unwillingness to share information with others will be presented in the following section on the so-called information-exchange dilemma. Subsequently, a concept will be discussed which may potentially be successful in influencing people's willingness to share information—even in an information-exchange dilemma: the concept of group awareness. Following this, a further aspect supposed to affect people's information-sharing behavior will be presented: the need for self-presentation. This need is conceptualized as a personality variable. These theoretical considerations close with hypotheses regarding the interplay of group awareness and self-presentation in the information-exchange dilemma.

An empirical section follows this theoretical analysis, presenting an experimental laboratory study which was conducted with the intention to test the postulated hypotheses. This empirical section begins with a description of the methods employed in the current study. The results of the study are subsequently reported. In conclusion, the major findings are reviewed in the discussion section.

The information-exchange dilemma

From a psychological point of view, an unwillingness to share knowledge with others is not a surprising observation: transmission of information is often regarded as a loss of power, and entering information into a database is additionally associated with extra time and effort. Therefore, the decision regarding whether to pass on information or not represents a social dilemma (Dawes 1980; Kollock 1998; Komorita and Parks 1995; Olson 1965; Weber et al. 2004). An individual group member does not benefit from sharing his/her own knowledge with others (Barkhi 2005; Bimber et al. 2005; Cabrera and Cabrera 2002; Cress and Kimmerle 2007a; Kalman et al. 2002; Sohn and Leckenby 2007; early considerations concerning the disparity between who benefits from an application and who does the work can be found in Grudin 1988). On the contrary, he/she saves time and remains in a leading or advantaged position by withholding information. On these grounds, withholding information is the most advantageous strategy. An individual is able to retrieve information from the database without contributing information in turn (Cress and Hesse 2006). However, if all involved group members decide to behave according to this self-advantageous strategy, then nobody can use the shared database and each member has to

compile the needed information for his/herself (Riss et al. 2007). As a consequence, the group as a whole suffers from individually efficient behavior (Cress and Kimmerle 2007b; Cress et al. 2006; for a recent review on the information-exchange dilemma, see Kimmerle and Cress 2007b; for a discussion of the free-riding problem in the context of CSCL see Kreijns et al. 2003).

However, recent research has shown that the individual's willingness to share knowledge in the face of the information-exchange dilemma can be influenced by the use of so-called group-awareness tools (Cress and Kimmerle 2007). The notion of group awareness and the application of corresponding tools will thus be presented in the following section.

Group awareness

Over the last few years, the concept of group awareness has received increasing interest in the relevant literature (Begole et al. 1999; Briggs 2006; Endsley 1995; Gross et al. 2005; Soller et al. 2005; Tam and Greenberg 2006; for an application of group awareness in CSCL see Kreijns et al. 2002). Group awareness refers to information received by members of a group about the other group members, about mutually employed objects, and about current group processes, in order to efficiently carry out certain tasks (Gross et al. 2005). Normally, in face-to-face situations, this kind of information is directly available. In situations of computer-mediated communication (CMC) and CSCL, however, group-awareness information is only available via technical support.

Carroll et al. (2003) distinguish three kinds of awareness—social awareness, action awareness, and activity awareness—in CMC settings and point out that each variant can be supported by certain tools. With *social awareness*, Carroll et al. (2003) refer to the user's consciousness of the presence of others. A tool which makes the presence of others visible (e.g., by providing photographs of the team members who are currently present) can foster social awareness. This facet of group awareness can be considered equivalent to the concept of social presence (Gunawardena 1995; Short et al. 1976), since social presence is defined as a sense of awareness of the presence of an interaction partner (cf. also Kreijns and Gerrissen 1999; Kreijns et al. 2004)¹. *Action awareness* exceeds the simple knowledge about who is around. Tools which support action awareness provide information about what is going on, e.g., which actions the group is carrying out. *Activity awareness* relates the actions of group members to the task to be performed. Activity awareness tools therefore provide information regarding completion of the group goal: activity awareness increases knowledge on the group's task performance.

In the current study, a group awareness tool was used to provide social awareness information by presenting personal information as well as photographs of the involved team members. Additionally, the tool fostered activity awareness by presenting feedback on the contributions made to the database by group members. Awareness information was presented in three conditions differing according to their richness: In the control condition no activity awareness was induced. In the group-feedback condition, activity awareness in the sense of information about *cooperative* group members was provided. And in the individual-feedback condition, information was provided concerning cooperative group members *as well as* additionally allowing for self-presentation.

These three conditions were implemented on the basis of our belief that the individual's need for self-presentation could play an important role in their willingness to share their

¹ Another related notion is the concept of teleproximity which also addresses awareness of presence between learners (Hollan and Stornetta 1992; Tang and Rua 1994).

knowledge with others. In order to test whether this is the case, self-presentation as a personality variable is considered in the current study. In the following section, the self-presentation construct will be explored, before we turn to the study's hypotheses.

Self-presentation

Self-presentation refers to strategic activities designed to give certain impressions to other people (Goffman 1959). Self-presentation is an important motivation of behavior in both offline (Jones and Pittman 1982; Taylor and Altman 1987) and online situations (Johnsen 2007; Joinson 2001; Joinson and Dietz-Uhler 2002; Tidwell and Walther 2002; Wallace 1999; Walther 1996). Self-presentation and impression management have recently been examined in online-dating settings (Ellison et al. 2006; Gibbs et al. 2006), in online forums (Lee 2005), in diaries in web communities (Moinian 2006), in weblogs (Trammell and Keshelashvili 2005), as well as with respect to personal web sites (Marcus et al. 2006; Schau and Gilly 2003).

In computer-supported environments, individuals have greater control over their self-presentational behavior than in offline settings. Online interactions can thus be managed more strategically. For example, the hyperpersonal model of CMC (Walther 2007) postulates that people use the technological characteristics of CMC with the goal to manage the impressions they give to other people and to assist desired relationships. For this reason, self-presentation is also thought to play an important role in computer-supported information-exchange situations like the information-exchange dilemma. It is assumed that virtually all people have a need for and the ability to present themselves in a certain way.

It is, however, also conjectured that people differ in terms of the intensity of this need. In line with this consideration, Snyder (1974, 1987) developed a personality construct termed *self-monitoring*. The self-monitoring (SM) of expressive behavior comprises self-observation and self-control and is guided by situational cues to social adequacy (Gangestad and Snyder 2000). In an alternative conception of the SM construct proposed by Wolfe et al. (1986), a distinction is made between acquisitive and protective self-presentation. *Acquisitive self-presentation* pertains to the tendency to actively realize social profits, i.e., an acquisitive self-presenter presumes social reward given that she/he manages to behave appropriately in a certain situation. *Protective self-presentation* (PSP) refers to the avoidance of social rejection, i.e., a protective self-presenter fears social disapproval if he/she does not manage to behave appropriately in a social situation. Recent research has examined PSP in conjunction with loneliness (Jackson 2007), susceptibility to normative influence (Wooten and Reed 2004), alcohol use (Korn and Maggs 2004), or social physique anxiety (Brewer et al. 2004).

We believe that people are interested in self-presentation in general. We thus suppose that individuals present themselves in a more positive light when their behavior is identifiable by others. Consequently, we expect the highest contribution rate to occur in the individual-feedback condition:

A main effect for activity awareness with respect to participants' cooperation rate is hypothesized (Hypothesis 1).

In addition, it is supposed that high protective self-presenters are more cooperative than low protective self-presenters, when activity awareness allows for the identification of individual behavior and consequently for self-presentation. Where such activity awareness is lacking, high and low protective self-presenters are assumed to be equally cooperative:

An interaction effect of PSP and activity awareness with respect to cooperation rate is hypothesized (Hypothesis 2).

Method

Participants

One hundred nineteen university students participated in the study (58.8% were women). They were informed that they would be participating in a group study using computers. Participants were randomly assigned to one of the three conditions with 43 participants in the control condition, 37 in the group-feedback condition, and 39 in the individual-feedback condition.

Procedure

Participants were led to believe that they would be one of six people working in a group distributed across six locations and connected via a database. In fact, participants worked independently of the others: the behavior of the other participants was simulated using software. The participants' task entailed the calculation of fictitious salesperson's salaries (Cress 2005). In a first phase, participants were required to calculate the *base salaries* of as many salespersons as possible. In a second phase, the *total salaries* were to be calculated. Participants received money according to the number of base and total salaries calculated. Following the calculation of a base salary, participants had to decide whether to share their result with the other group members by contributing it to the shared database. When contributing a base salary, the respective participant had to wait for the somewhat lengthy transfer of the result to the database. During this waiting time, he/she was not able to continue with further calculations. Hence, each participant could calculate and consequently earn more by contributing fewer base salaries to the database. In the second phase, participants received money for each total salary calculated. In calculating a total salary participants required the appropriate base salary. If this base salary was not available (i.e., it was neither in the database nor had it been calculated by the participant in the first phase), the participant had to catch up on this calculation in the second phase. This resulted in a loss of time in which the participant was not able to earn money. Each person therefore earned less if there were fewer pieces of information in the database. Hence, participants found themselves in a characteristic information-exchange dilemma: an individual earned less, the more information he/she shared with others, and at the same time, everybody earned more, the more pieces of information were available in the database. The succession of phase 1 and 2 was repeated three times. Except for the control condition, activity awareness information was presented by an awareness tool after each of the three trials. The different experimental conditions are presented in the following section.

Conditions

Three experimental conditions were realized in this study:

There was a *control* condition without activity awareness.

There was a *group-feedback* condition in which the awareness tool induced activity awareness by presenting the *average* number of contributions of the other five members of the group as well as the participant's own number of contributions in the first phase of the previous trial (Fig. 1).

There was an *individual-feedback* condition in which an awareness tool induced activity awareness by *separately* providing the number of contributions of each of the six members of the group in the first phase of the previous trial (Fig. 2).

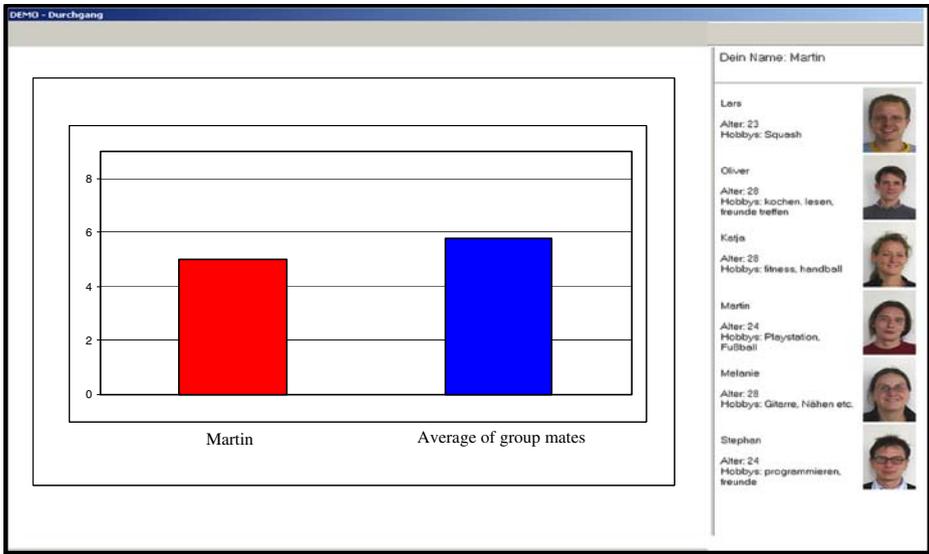


Fig. 1 The group-feedback condition with “Martin” as relevant participant

In the control condition as well as in the individual-feedback condition, the contribution behavior of the other group members was provided on the basis of the identical pool of data. In order to foster social awareness photographs of the team members were presented in all conditions (here, photographs were particularly intended to provide a personal impression of the others; their presence during the experiment could be taken for granted anyway).

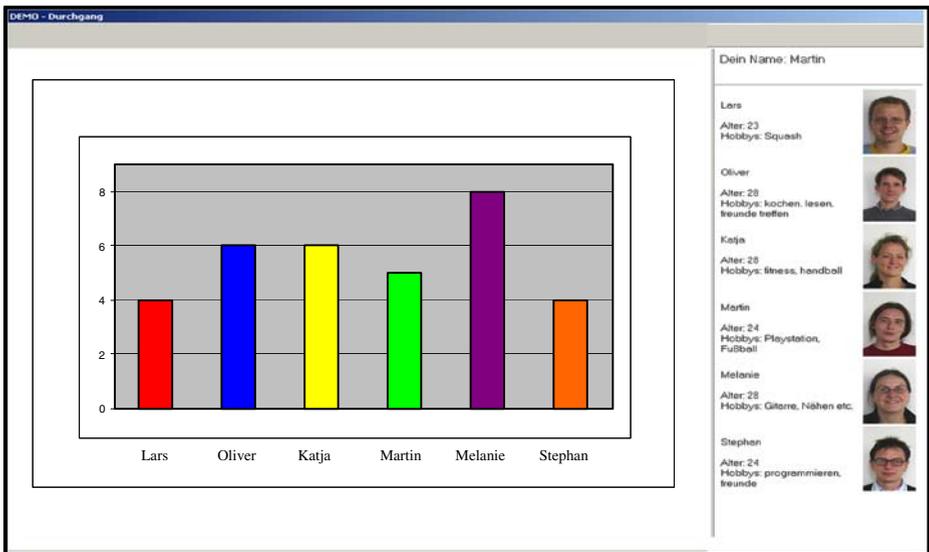


Fig. 2 The individual-feedback condition enabling identification of each participant’s behavior

Measure

A German version of the self-presentation scale according to Wolfe et al. (1986) was employed. This scale consists of two subscales (Laux and Renner 2002): “acquisitive self-presentation” and “protective self-presentation”. The subscale “acquisitive self-presentation” was excluded based on the consideration that the individual-feedback condition—as operationalized here—is socially too reduced to allow for social profits such as making new friends. The subscale “protective self-presentation” on the other hand, was considered relevant for the present research question, given the adequate situational authenticity, whereby individuals sensitive to such processes could indeed experience social disapproval. The PSP-subscale (*Concern for Appropriateness Scale*) consisted of twelve items. All items were rated on a four-point scale with endpoints labeled 1 (*not at all*) and 4 (*very*).

Results

The employed scale showed satisfactory internal consistency. Cronbach’s alpha for PSP was $\alpha=0.83$ (Laux and Renner (2002) report $\alpha=0.85$ for the Concern for Appropriateness Scale with 329 participants). With respect to PSP, participants were separated into two groups (low vs. high protective self-presenters) via a median split (MacCallum et al. 2002). Cooperation rate was defined as the quotient of contributed and totally calculated base salaries. This quotient in the second and third trial served as the main dependent variable (the first trial was excluded because feedback was provided for the first time *after* the first trial).

Test of hypotheses

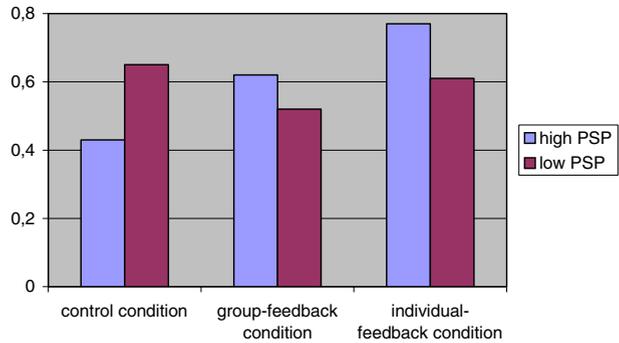
In order to test Hypothesis 1 independent sample *t*-tests were calculated comparing the individual-feedback condition with the control condition as well as with the group-feedback condition (for the sake of completeness we also compared the group-feedback condition with the control condition applying an independent sample *t*-test).

The analyses showed that the individual-feedback condition differed significantly from the control condition as well as from the group-feedback condition: $M_{ifc}=0.69$ ($SD=0.28$) vs $M_{cc}=0.54$ ($SD=0.35$), $t(80)=2.22$, $p=.015$, one-tailed; $M_{ifc}=0.69$ ($SD=0.28$) vs $M_{gfc}=0.56$ ($SD=0.32$), $t(74)=1.91$, $p=.030$, one-tailed. The control condition and the group-feedback condition did not differ from each other: $M_{cc}=0.54$ ($SD=0.35$) vs $M_{gfc}=0.56$ ($SD=0.32$), $t(78)=-0.33$, $p=.746$.

In order to test Hypothesis 2 an ANOVA with PSP and group awareness as independent variables was calculated. This ANOVA showed a significant interaction effect for PSP and group awareness, $F(2, 113)=4.28$, $p=.016$. Figure 3 illustrates this effect.

As expected, there was no difference between low and high protective self-presenters in the group-feedback condition: $M_{low}=0.52$ ($SD=.33$) vs $M_{high}=0.62$ ($SD=0.32$), $t(35)=-0.95$, $p=.347$, two-tailed. But there was a significant difference in the individual-feedback condition: $M_{low}=0.61$ ($SD=0.30$) vs $M_{high}=0.77$ ($SD=0.24$), $t(37)=-1.82$, $p=.039$, one-tailed. However, an unexpected difference was also found in the control condition: $M_{low}=.65$ ($SD=0.33$) vs $M_{high}=0.43$ ($SD=0.34$), $t(41)=2.09$, $p=.043$, two-tailed.

Fig. 3 Cooperation rates for the three conditions according to PSP (low vs high protective self-presenters)



Single items analyses

In order to better understand the way in which the need for PSP influences people's willingness to share their knowledge, it is worthwhile taking a closer look at those items which were more exactly able to predict the protective self-presenters' selective contribution behavior. We found three items showing the same interaction effect with group awareness as the total 12-item scale. In the following list, these items are presented with their exact wordings (our translations from German) and corresponding statistics resulting from ANOVAs with the PSP-items and group awareness as independent variables:

"If all persons of a group act in a certain manner, then I feel that this must be the appropriate way to behave." The ANOVA yielded an interaction effect with respect to cooperation rate, $F(2, 113)=6.03, p=.003$.

"The slightest hint of disapproval in the eyes of another person is sufficient to make me change my behavior." The ANOVA yielded an interaction effect with respect to cooperation rate, $F(2, 113)=4.73, p=.011$.

"It is important for me to fit into the group to which I belong." The ANOVA yielded an interaction effect with respect to cooperation rate, $F(2, 113)=3.54, p=.032$.

That which these three items have in common is that they all loaded onto the same factor resulting from a main component analysis of the twelve PSP-items with quartimax rotation. This procedure revealed three factors.

The first factor had an eigenvalue of 4.30 and accounted for 35.8% of the explained variance. With regard to content and in accordance with Laux and Renner (2002), we labeled this factor "protective variability". This factor's items emphasize a person's ability to adapt the own behavior to a certain social situation.

The second factor had an eigenvalue of 1.93 and accounted for 16.1% of the explained variance. With regard to content, we labeled this factor "fear of social disapproval". This factor's items emphasize a person's dread of being negatively evaluated by others.

The third factor had an eigenvalue of 1.06 and accounted for 8.9% of the explained variance. With regard to content and in accordance with Laux and Renner (2002), we labeled this factor "protective social comparison". This factor's items emphasize a person's inclination to conform with other people.

The three items showing an interaction effect with group awareness all loaded onto the factor "fear of social disapproval". The protective variability items and the protective social comparison items did not show significant interaction effects with group awareness.

Discussion

The individual's motivation to share her/his knowledge with other people is an essential precondition for successful CSCL (Stahl et al. 2006). A central reason for people's unwillingness to share their knowledge can be found in the viewpoint that computer-supported knowledge exchange represents a social dilemma. The present article studied the role of group awareness and self-presentation within this information-exchange dilemma. On the one hand, the study entailed the examination of three different group-awareness conditions in a dilemma situation. On the other hand, the personality variable of protective self-presentation was investigated. The study thus takes an approach based on an aptitude-treatment interaction (Cronbach and Snow 1977), i.e., it examines situational and personal determinants of behavior as well as their interactions within an information-exchange dilemma. The construct of PSP as a personality variable is employed as an auxiliary means, insofar as knowledge concerning individuals' characteristics can help provide information about the situations in which these people exhibit a certain behavior. Thus one can learn more about the effectiveness of group awareness. To this end, we observed the way in which people with high and low scores in PSP reacted to the group awareness information provided. Based on observations of ensuing behavioral reactions, conclusions can be drawn regarding the effect of group awareness which is generated by a respective tool.

People receiving individual feedback on cooperative group mates clearly increase their cooperation rate in comparison to those receiving no feedback and those merely receiving group feedback. The result showing that group feedback failed to increase cooperation rates (compared to no feedback) suggests that—at least in the study reported here—mere feedback on cooperative group mates in itself does not necessarily enhance the willingness to share one's knowledge. Rather, in addition to this perception of cooperativeness and the resulting trust in others in the information-exchange dilemma (Kimmerle et al. 2006), self-presentation opportunities should be made available.

The interaction effect found for group awareness and PSP shows that people with a high need for PSP are particularly cooperative in the individual-feedback condition. However, without feedback allowing for identifiability, it is this very subgroup that proves particularly selfish in demonstrating a low willingness to share knowledge. Two insights can be gained from this finding. Firstly, we learned how group awareness can be affected by individual feedback: a situation in which the behavior of every single person concerned can be exactly identified is used by the participants in the information-exchange dilemma for purposes of self-presentation. Secondly, important insights can be gained concerning the psychology of individuals with a high need for PSP: even though this result cannot be generalized discretionarily beyond the current setting of computer-supported information exchange, it can be concluded that high protective self-presenters do not simply try to present themselves in a positive manner when their activities are recognizable to others, but that they are also especially uncooperative when this is not the case.

Taking a closer look at those individual items showing the same interaction effects with the group-awareness condition as the total PSP-scale can facilitate a more detailed understanding of high protective self-presenters' contribution behavior. In its entirety, the PSP construct is composed of three facets: "protective variability", "fear of social disapproval", and "protective social comparison". The fact that the individual items concerned all load onto the factor "fear of social disapproval" suggests that contribution behavior is caused merely by people's dread of being negatively evaluated by their peers. People's inclination to conform with others and the ability to adapt their own behavior to a certain social situation seem to be secondary. However, this fear of social disapproval can in

our opinion only explain why high protective self-presenters enhance their cooperation rate when their behavior is identifiable. It cannot explain why these very individuals decrease their cooperation rate in an anonymous situation. Further research is required to examine this issue in greater detail.

In the present study we decided in favor of a highly controlled experimental laboratory study since we attached great importance to identifying principles of cause and effect. Admittedly, this kind of research involves also some problems. The crucial point is probably that laboratory settings are inevitably less rich and genuine than CSCL situations in the real world. Consequently, there might be a variety of underlying processes in information-exchange situations which we could not identify in this study but which do play a role in everyday situations like in communities of practice or virtual communities in general (Hsu et al. 2007). In order to separate out potential motivational or emotional processes accompanying people's behavior in computer-supported information exchange other methodological approaches should be applied in future research. For example, analyses of actual verbal interactions could shed light on further relevant aspects of people's willingness to share their knowledge in CSCL situations.

Nevertheless, we believe that the present study's fundamental conclusions do not solely hold true for the specific scenario examined here but can also be applied to many other situations of computer-supported information exchange. Therefore, group awareness as well as PSP are important aspects in CSCL and remain worth studying.

While underlying processes of information exchange were not uncovered in their entirety, it can be concluded that the approach adopted in the present article—gaining new insights by capturing interactions of personal and situational aspects—proved fruitful. This approach could help researchers gain new insights concerning the effects of group awareness and the influence of PSP as a personality variable. It is therefore our view that such a procedure can also be recommended for research in other issues of CSCL.

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