

Regulation during cooperative and collaborative learning:

A theory-based review of terms and concepts

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Abstract

This paper reviews the terms and concepts that have been used for describing regulation of learning during cooperative and collaborative learning and suggests differentiating them on the basis of which parts of a regulatory feedback loop model are being shared. During cooperative and collaborative learning, not only self-regulation but also the regulation of the group process is important. This regulation might occur on an individual but also on a social level. Several modes of regulation have been identified, but the terms used for them vary tremendously--including social regulation, socially shared regulation, co-regulation, and other-regulation. This paper seeks to clarify the diverse terminology. To this end, we use a theoretical framework based on Winne and Hadwin's (1998) model of self-regulated learning to analyze how the different terms are used in the literature. We make and exemplify suggestions for a consistent usage of terms.

Key words: self-regulated learning, collaborative learning, cooperative learning, regulation of learning, socially shared regulation, co-regulation, other-regulation, social regulation

Regulation During Cooperative and Collaborative Learning:

A Theory-Based Review of Terms and Concepts

Cooperative and collaborative learning play a major role in today's teaching practices in both school and university. Although it is known from self-regulated learning (SRL) research that regulation of learning is an important factor for learning outcomes (e.g., Sitzmann & Ely, 2011), it is only in the last decade that educational researchers have turned their attention to regulation in cooperative and collaborative learning settings (e.g., Hadwin, Järvelä, & Miller, 2011; Vauras, Iiskala, Kajamies, Kinnunen, & Lehtinen, 2003; Volet, Summers, & Thurman, 2009). During cooperative and collaborative learning, not only *self*-regulation but also *social* modes of regulation occur. Social modes of regulation are currently an active research area. After years of concentration on cognitive aspects of cooperative and collaborative learning, research on regulatory activities on the group level might advance the fields of cooperative and collaborative learning. By investigating social modes of regulation, researchers might shed light on neglected characteristics of learning in groups. However, inconsistencies in the terms that are being used makes it difficult to understand and compare results. This might handicap future research, especially for those researchers who newly join the field or work in adjacent fields. Thus far, several terms are in use for different phenomena of regulation during cooperative and collaborative learning, including *co-regulation*, *other-regulation*, *social regulation*, and *socially shared regulation*. These terms seem to cover partly the same, partly different modes of regulation (cf. Hadwin & Oshige, 2011; Schoor & Bannert, 2012; Vauras et al., 2003; Volet, Summers, et al., 2009; Volet, Vauras, & Salonen, 2009). In addition, different authors seem to use the terms in different ways. This makes it difficult to understand what each author is referring to. Therefore, one aim of this paper is to review the literature and analyze how these terms are used.

Moreover, we have found that the field is still missing a detailed framework for a clear terminology. Therefore, a second aim of this paper was to suggest such a framework. The main idea of the proposed framework is to ask, based on a regulatory feedback loop model, what essentially is the social aspect of each social mode of regulation.

In the following, we first sketch the topic of our analysis – cooperative and collaboration learning, regulation of learning, and social modes of regulation. Then, we describe our theoretical framework for analyzing the regulation terms, which is based on Winne and Hadwin's model of self-regulated learning (Winne, 2014; Winne & Hadwin, 1998), as distinguished from prior approaches of classifying social modes of regulation. After this, we briefly describe our review procedure and analyze the terms for social modes of regulation during cooperative and collaborative learning that we found in the literature, and their respective meaning, which we analyzed on the basis of our theoretical framework. In addition, we suggest a terminology for the distinct modes of regulation during cooperative and collaborative learning and give an example for each of these modes. This new theoretical approach allows us to derive additional, theoretically and practically plausible modes of regulation that we briefly sketch. We conclude with several open questions that emerged during our analysis.

Cooperative and Collaborative Learning

A very broad definition of cooperative and collaborative learning was provided by Dillenbourg (1999): "It is a situation in which two or more people learn or attempt to learn something together" (p. 1). Although there is some discussion whether dyads can be seen as a group or not (e.g., Moreland, 2010; Williams, 2010), we include in this article both dyads and small groups within cooperative and collaborative learning (cf. Dillenbourg, 1999; Iiskala, Vauras, Lehtinen, & Salonen, 2011; Volet, Summers, et al., 2009; Williams, 2010).

Dillenbourg's (1999) distinction between cooperative and collaborative learning refers to whether "a truly joint effort" (Dillenbourg, 1999, p. 2; cf. Dillenbourg, Baker, Blaye, & O'Malley, 1996; Roschelle & Teasley, 1995) is made (in collaborative learning) or whether instead "the labour is divided in a systematic way" (in cooperative learning) (Dillenbourg, 1999, p. 2; cf. Dillenbourg et al., 1996; Roschelle & Teasley, 1995). In collaborative learning, the ultimate goal is co-construction of knowledge shared among members of the group (cf. Chi & Wylie, 2014; Dillenbourg, 1999; Resnick, 1991; Roschelle & Teasley, 1995; Scardamalia & Bereiter, 2006). An additional scenario would involve students working individually on individual products but at the same time, so they can help each other (co-active learning, e.g., Bennett & Dunne, 1992). We explicitly include both cooperative and collaborative learning but not co-active learning (because there is no joint or pooled product) in our review. As there is no agreed upon umbrella term for both concepts, we will speak of cooperative and collaborative learning to make this clear. This definition of cooperative and collaborative learning also excludes two scenarios that are prominent for some modes of regulation in a social context: parent-child interactions and teacher-student interactions.

Regulation of Learning

The term *regulation* stems from the area of cybernetics (Ashby, 1964). Essential to it is the closed feedback loop. A key feature of the closed feedback loop is a controlled variable (i.e. the variable that is the target of regulation; Powers, 1973). This variable is monitored by the regulated system and compared to a standard or reference value. In case of a discrepancy, a control action (i.e. an action that regulates the system in the direction of the standard) is taken, which closes the feedback loop. Therefore, regulation occurs at a meta-level which encompasses several characteristics:

1. *Regulation* always occurs with reference to some standard or goal (Hadwin et al., 2011; Pintrich, 2000; Winne & Hadwin, 1998) against which actual performance is monitored. Therefore, regulated learning is goal directed (Hadwin et al., 2011).
2. *Regulation* includes meta-level processes such as monitoring, evaluating, and controlling the controlled variable. Monitoring refers to the determination of the actual value of the controlled variable. Then this actual value is evaluated against the goal. If the monitoring and evaluation of actual performance reveals some discrepancy to the desired goal, a control action might be taken. This action might be, for example, applying a study strategy.

This principle of discrepancy reduction has been applied not only to self-regulation of behavior but also to self-regulated learning (e.g., Butler & Winne, 1995; Pintrich, 2000; Thiede & Dunlosky, 1999; Winne & Hadwin, 1998) and interactive instruction (Narciss, 2008). Self-regulation of learning “refers to a learner’s deliberate planning, monitoring, and regulating of cognitive, behavioral, and motivational/emotional processes towards completion of an academic task/goal” (Hadwin et al., 2011, p. 68). Models of self-regulated learning (SRL) that more or less explicitly include a feedback loop based on the principle of discrepancy reduction include those of Schunk and Zimmerman (1998; Zimmerman, 1989, 2000), Pintrich (2000), and Winne and Hadwin (1998). Pintrich (2000) even concludes that all SRL models assume a regulatory loop. The controlled variable and outcome can vary in their details. According to Pintrich (2000), this might involve cognition, motivation/affect, behavior, or the environment. Following Winne and Hadwin (1998), the targets of regulation are the products of four stages: task definition, goals/plans, studying tactics and metacognitive adaptations. In the context of cooperative and collaborative learning, the teamwork itself also might be the target of regulation.

Social Modes of Regulation

Self-regulated learning can occur not only during individual learning but also during cooperative and collaborative learning (e.g., Järvelä & Hadwin, 2013). However, regulation during cooperative and collaborative learning encompasses more than mere self-regulation of its group members (e.g., Grau & Whitebread, 2012). In groups, it is not only the individual learning processes that have to be regulated, but also the group's learning processes as a whole. Social modes of regulation refer to the group level of regulation, whether it be an individual self-regulating towards a common group goal, individuals helping each other regulate their work toward a group goal, or joint regulation of group learning on the group level.

The aim of the present paper is to take a closer look at the conceptualizations of these social modes of regulation. Therefore, we excluded from this review papers that studied only self-regulation in the context of cooperative or collaborative learning (for example, how self-regulation is scaffolded in a cooperative or collaborative learning setting, e.g., Azevedo, Winters, & Moos, 2004) and not a social mode of regulation.

The importance of the group level has been recognized in several theoretical approaches to regulation during cooperative and collaborative learning. In some approaches, there even seems to be an equation of regulation mode (e.g., self-regulation, co-regulation) and corresponding theoretical perspective (Hadwin & Oshige, 2011) insofar as socio-cognitivists are said to study self-regulation, and socio-constructivists are likely to study co-regulation. However, these different modes of regulation are distinct phenomena and not merely different perspectives on the same phenomenon. Therefore, we want to disentangle theoretical perspectives (e.g., socio-cognitivism, socio-constructivism) from modes of social regulation for a better understanding. Hence, we briefly sketch the different theoretical perspectives in the following; we refer the reader to more exhaustive reviews in Nolen and

Ward (2008) and Hadwin and Oshige (2011) for further elaboration (see also Martin, 2004, 2007, for work on the idea of the self in these perspectives).

The socio-cognitive approach. From a (socio-) cognitive perspective, the role of the social in self-regulated learning is to influence individual regulation. The situation and context--including the social context--can influence self-regulation of learning (cf. Nolen & Ward, 2008). This approach focuses on the individual, which is the unit of analysis (Hadwin & Oshige, 2011; Nolen & Ward, 2008; Volet, Vauras, et al., 2009). However, the social context provides support for the development of self-regulation (e.g., Schunk & Zimmerman, 1997). Relevant mechanisms for this support are modeling of self-regulation and feedback (Schunk & Zimmerman, 1997) which traces back to Bandura (e.g., 1986). The socio-cognitive approach grounds some research on social models of regulation; for example, Rogat and Linnenbrink-Garcia (2011) place their work in the context of socio-cognitive approaches but also draw on “research examining social regulation of group learning” (p. 376). Järvelä and Hadwin’s (2013) analysis of self-, co- and socially shared regulation is also based on the socio-cognitive model of self-regulated learning by Winne and Hadwin (1998).

The socio-cultural approach. Based on Vygotsky, the socio-cultural approach focuses not on individual cognition and motivation (as is the socio-cognitive approach) but on socially mediated cognition and motivation at the individual level (Nolen & Ward, 2008). The role of the social is that of a mediator of cognition. The social mediation takes place by externalization and internalization (McCaslin & Hickey, 2001; Nolen & Ward, 2008). The level of analysis is the interaction of the individual with the culture. Although social mediation and cultural influences are relevant mechanisms in all kinds of relationship, social

modes of *regulation* within this approach usually refer to an asymmetric relationship where one person externalizes her skill to make it accessible for the other person who, during their learning process, internalizes that skill (cf. Hadwin, Wozney, & Pontin, 2005). In a broader sense, the culture or social environment as a whole supports the individual's internalization (Volet, Vauras, et al., 2009) or the person's development (McCaslin, 2009; McCaslin & Burross, 2011). Internalization is often seen as a transition from other-regulation to self-regulation (Wertsch & Bivens, 1992), or the appropriation of self-regulation. Other-regulation, in this context, refers to the notion that a more capable person undertakes regulatory tasks for someone else as long as s/he is not able to self-regulate. This transitional period from other- to self-regulation is often called co-regulation (Hadwin & Oshige, 2011; McCaslin & Hickey, 2001) although the term co-regulation is also used to express that not only the individual but also social sources influence a person's development (McCaslin, 2009; McCaslin & Burross, 2011).

The situative approach. An approach that emphasizes the system in which activity occurs is the situative perspective (e.g., Greeno, 2006). Research on socially shared regulation emerged from within this perspective. Here, the main claim is that all cognition occurs as activity within a system. Whereas the socio-cultural approach retains an interest in the individual whose processes are shaped by the social environment through internalization, the situative approach views processes from the systemic point of view. The focus is on the the individual within a system rather than on the individual. The role of the social is that of a system with which the individual is interwoven. The system might be a learning group, but also a community of practice (Wenger, 1998), or a whole society. The system encompasses not only people, but also material, such as the instruments of a cockpit, as in the studies of distributed cognition (e.g., Hutchins, 1995). The material can serve as external

representations of knowledge of the system. In communities of practice (Wenger, 1998), a group's (community's) knowledge is preserved in form of practices (cf. Greeno, 2006). It is often claimed that, therefore, the unit of analysis must be the system itself, such as a group (Nolen & Ward, 2008). In slight contrast to this claim, Greeno (2006) stresses that analyses at multiple levels, including analysis at the individual level, is possible within the situative perspective. Regulation of group learning, in this perspective, is necessarily studied not only at the individual level but also at the group level.

A Framework to Analyze Regulation Terms

In order to analyze the regulation terms we found in the literature, we used the model of SRL by Winne and Hadwin (1998) as a basis for asking which elements of a regulatory feedback loop model are being shared in the respective social mode of regulation. In this section, we want to further explain this approach and contrast it with prior approaches. Therefore, we discuss the SRL model by Winne and Hadwin (1998, see also Winne, 2014) first, before sketching prior approaches to classifying social modes of regulation. Then we explain the ways in which the elements of Winne and Hadwin's model can be social in cooperative and collaborative learning, which provides the basis for our analysis of what is being shared in different social modes of regulation.

Model of Self-Regulated Learning by Winne and Hadwin (1998)

According to Winne and Hadwin (1998), self-regulated learning encompasses four stages that are defined by the products that are created in the respective stage. In stage 1, the student develops a perception of the task. In stage 2, goals and plans for studying are created that also include plans on concrete study tactics. In stage 3, these study tactics and strategies are enacted, which results in visible (by-) products of studying (e.g., notes) and new or

changed cognitive structures (e.g., knowledge). The product of stage 4 are adaptations, that means changes in how to work on the task, mostly for future tasks, but also large-scale adjustments of the current task that involve all other stages. These four stages are only weakly sequenced. For example, it is possible that the task definition is skipped, that after enacting study tactics the goals and plans are changed, and metacognitive adaptation can always occur (Winne & Hadwin, 1998). However, the stages are recursive, meaning that products of one stage, for example, can serve as conditions for another. An example of the embeddedness of tasks within each other is provided by Winne (2014).

Using the acronym COPES, Winne and Hadwin (1998, see also Winne, 2014) refer to a cognitive architecture of five components that interact in each of the stages: Conditions, operations, products, evaluations and standards. *Conditions* are differentiated into task and cognitive conditions. Task conditions refer to environmental factors that influence the learning, such as resources, instructional cues, the time available, and the social context. Cognitive conditions include the learner's knowledge of the domain, of the task, and of study strategies, motivational factors, and beliefs and dispositions of the person. *Operations* refer to what is actually done and encompass both single cognitive operations and "coordinated sets of them" (p. 279) like study tactics and strategies. They transform conditions and create products and external performance. As for *products*, Winne and Hadwin (1998) discuss two forms: Internally, cognitively, products are seen as "multivariate profile of attributes" (p. 281), such as goals for studying that are created during stage 2. Externally, products can be observed as behavior or performance. Winne (2014) defines internal and external products as generated by operations. *Evaluations* are created when a student monitors a product against his or her standards. These cognitive evaluations mark whether there is a discrepancy between the current state of the product and the standards. If there is a discrepancy, the student might enact a controlling measure. This could be a change in standards, an alteration

of conditions, or some new operation. The last component of COPES is the *standards*. They “characterize ideal, optimal, or satisficing states” (Winne & Hadwin, 1998, p. 281). Studying is seen as goal-directed activity, and these goals are thus represented as profiles of standards; students set the goal of achieving products that meet their standards. In essence, these components make up a feedback loop that is working in all four stages. For an excellent review of this model, see Greene and Azevedo (2007).

The advantage of Winne and Hadwin’s model as compared with other SRL models is its more complex and fine-grained description of phases and processes. One of its merits lies in the distinction between changing stages and constant processes (the COPES architecture which is constant across each stage). Moreover, this approach makes it possible to tie together several phases in a complex way (e.g., products of one stage become conditions for another, controlling can change operations, but also standards or conditions, etc., cf. Greene & Azevedo, 2007).

Prior Approaches to Differentiating Social Modes of Regulation

Winne and Hadwin’s model has already been used by Järvelä and Hadwin (2013) to illustrate the three concepts of self-regulation, co-regulation, and socially shared regulation. Järvelä and Hadwin did this on a more general level, illustrating the *I*, *you*, and *we* perspective of the three concepts. In self-regulation, there is an *I* and *my perspective* on both components (COPES) and stages (“*my goals*”, “*my task perception*”, “*my operations*”). In contrast, co-regulation is conceptualized as the “temporary support for each other’s SRL” (Järvelä & Hadwin, 2013, p. 29), implying a *you* and *your perspective* (I support “*your goals*”; “*your operations*”) on the self-regulation of another person (which is depicted as an independent self-regulatory loop). In shared regulation, finally, there is only one regulatory loop representing the *we* and *our perspective* (“*our goals*”, “*our operations*”). The

differentiation of *I*, *you*, and *we perspective* each are applied on the whole SRL process and not differentiated into components (COPES) or stages (e.g., task definition, enacting study strategies).

In a similar way, Winne, Hadwin, and Perry (2013) analyzed self-regulation, co-regulation, and shared regulation in collaborative tasks. They also applied the *I*, *you*, and *we perspectives* on regulation, but additionally named different components and stages that regulation is applied to (task perception, goals, standards, plans, monitoring, strategy use etc.). However, they also applied a particular perspective (that is, either the *I*, *you*, or *we perspective*) to all components and stages in the same way; for example, in the mode in which goals are shared (only in shared regulation), it is also the case that task perception, strategy use, and so on are shared. There is no possibility that the sharedness of each of these components are independent from each other within a mode of regulation .

While these approaches are suitable to illustrate how different the nature of socially shared regulation is from previous concepts (self-regulation and co-regulation), they do not go far enough to capture the different social modes of regulation that lie in between of self-regulation on the one hand and socially shared regulation in collaborative learning on the other hand. We believe that in the cases of socially shared regulation and self-regulation it is clear that all components are shared (the *we perspective* in socially shared regulation) and unshared (the *I perspective* in individual regulation). However, as we will explain later, there exist social modes of regulation where not all COPES components can be subsumed under one perspective, be it *I*, *we* or *you*. Furthermore, these modes cannot be classified all into one mode of regulation without loss of information that is potentially interesting for research. These intermediate modes of regulation might differ in their potential to develop into socially shared regulation (the desired mode of regulation) or in their influence on learning outcomes. Indeed, the literature seems to be aware of modes of regulation that are more

nanced then three different modes that are usually discussed. Thus, we extend prior approaches insofar as we allow every COPES component to be shared or not independently from other components, and the constellation of sharedness or perspective (*I, you, we*), respectively, defines the kind of social mode of regulation.

Winne and Hadwin's Model of SRL as a Framework for Analyzing Social Modes of Regulation

In the following, we want to consider Winne and Hadwin's (1998) model of SRL as a means for better understanding what is essentially social in different notions of social modes of regulation. It is explicitly not our intention to develop a theory for regulation of cooperative and collaborative learning, but instead to provide a helpful framework for organizing the different constructs of regulation that are currently discussed in the literature. Winne and Hadwin's model of SRL is suitable for this purpose because it provides a detailed framework of stages and architecture that are also applicable to social forms of learning. In the following, we will discuss the ways in which the components and stages of Winne and Hadwin's model appear as shared or unshared in cooperative and collaborative learning.

The two main features of Winne and Hadwin's model are the proposed stages of self-regulated learning (task definition, goal setting and planning, enactment of study strategies, and metacognitive adaptation) and the proposed cognitive architecture (COPES). As for the stages, we can assume that in one form or another, a *group* of learners experiences stages of task definition, goal setting and planning, enactment of study strategies and metacognitive adaptations (e.g., Dillenbourg, Järvelä, & Fischer, 2009; Schoor & Bannert, 2012; Winters & Azevedo, 2005). As for COPES, we can also assume that groups work under some conditions, they operate / work together, and they create products which can be evaluated (jointly) against a potentially joint standard for the group product. However, the more

interesting questions are the extent to which the stages are real group stages, the extent to which the stages are executed jointly (that is whether they are shared or not), and whether and how the COPES components are shared.

We assume that in the social context every COPES component of the cognitive architecture of (in every stage of Winne and Hadwin's model) could be shared or not, more or less independently of each other. If a component is shared, we assume that the group members take on a *we perspective* with regard to this component. If it is not shared, either an *I perspective* or a *you perspective* is possible, with the *I perspective* referring to one's own individual COPES component, and a *you perspective* referring to another group member's COPES component. In one extreme, none of the COPES components in any of the stages would be shared (*I perspective* in all components and stages). Individual group members would be working co-actively, but not with each other. In the other extreme, all components of COPES in every stage would be shared among all group members (*we perspective* in all stages and components). This would probably denote socially shared regulation of collaborative learning in its purest form. In this case, it would be justified to view and analyze the group as an entity that possesses a cognitive architecture like COPES on the group level. However, our social-cognitive view of social forms of COPES provides the opportunity to analyze all constellations in between these extremes. We believe that this can shed light on, for example, what happens when a group's socially shared regulation becomes unshared. A thorough analysis using COPES might help understanding problems in the socially sharing of regulation on the one hand, and how it develops on the other hand.

In the following, we discuss each COPES component with respect to its social form(s). Be aware that due to the recursive nature of Winne and Hadwin's model, some issues (e.g. goals, task definition) might be the product of one stage (e.g., stage 2) and a different component of another stage (e.g., stage 3), for example the standard (in the case of a goal) or

a condition (in the case of a task definition). The COPES components will be discussed with a focus on the most intuitive stage 3 (enactment of study strategies), but the other stages will be covered as well.

Conditions in cooperative and collaborative learning. With respect to a cooperative or collaborative learning situation, most of the task conditions are probably shared. Instructional cues as well as the social context are probably the same for all group members, although collaboration scripts (e.g., Fischer, Kollar, Stegmann, & Wecker, 2013) might give different instructions to the members of a group or assign different roles to them (e.g., Strijbos, Martens, Jochems, & Broers, 2004). Resources might be distributed (Hutchins, 1995; Johnson & Johnson, 1992) across group members, either naturally or by instruction. Time is usually the same for all group members unless there is freedom for the group to decide on its timely effort which might result in different notions and disagreement among the group members.

As for cognitive conditions, social forms first concern group dispositions and group beliefs, like collective efficacy (Bandura, 1997). These are truly social conditions, as they refer to the group as a whole. Also products from prior group stages might belong to these truly shared conditions. Another issue is whether individual cognitive conditions (beliefs, motivation, knowledge) are shared or not in the sense that they are the same across all group members. This tackles issues of group composition (Wang & Lin, 2007; Webb & Palincsar, 1996), which is an important condition for cooperative and collaborative learning.

Operations in cooperative and collaborative learning. Operations in Winne and Hadwin's model are not actually observable; only behavior, which is seen as a product within the COPES framework, is observable. However, in the case of true joint effort (i.e.

collaborative learning), the group members need to observe operations in favor of the joint group work in order to jointly work on it. Therefore, it makes more sense to define operations in groups as observable (as Winne, 2014, also does for individual learning).

Analysts can apply the different *I*, *you*, and *we* perspectives on operations. There could be truly shared, joint operations in a *we perspective*. An example is the behavior that has been described as *interactive mode of engagement* within the ICAP framework (Chi & Wylie, 2014). In this mode, all dialogue partners make substantive contributions and frequently refer to each other's comments. Resulting ideas are new to all dialogue partners, and no one could have generated these ideas alone. With regard to an *I perspective*, there are also individual operations during cooperative and collaborative learning, although these might occur more often (by definition) in cooperative learning. Apart from really individual operations, also dialogue within which partners do not refer to each other's utterances (*active* or *constructive* within the ICAP framework) could be classified as individual in our sense. With regard to a *you perspective*, these same operations of other group members might be target of (regulatory) observation or helping behavior. Sometimes, however, this help might develop into shared operations.

The sharedness of operations is probably not independent from that of products. Although there is probably no one-on-one connection of distinct operations to distinct products, it seems implausible to us that, on the more abstract level of sharedness, there could exist shared operations that lead to unshared products and vice versa.

Products in cooperative and collaborative learning. Products in cooperative and collaborative learning are quite different across stages, which is why we discuss its sharedness along the stages. The most prominent social products are probably those of stage 3 (enactment of study strategies). These products encompass both knowledge that is created

or acquired and visible products like an essay, a concept map, etc. For stage 3 products, the instruction in most cases of cooperative and collaborative learning makes it necessary that a joint product like a task solution or a joint text is created. With regard to knowledge, shared knowledge can emerge, which is one aspect of knowledge convergence (Weinberger, Stegmann, & Fischer, 2007) and refers to an overlap of individual knowledge bases, but also new unshared knowledge can be acquired or created. Shared knowledge and a joint product refer to a *we perspective* while unshared knowledge refers to the knowledge that a (single) individual acquires. This is therefore an *I perspective*. But a *you perspective* also makes sense in this context, especially in cooperative learning: When products created by another group member are the object of consideration.

Products of stage 1 (task definition) or 2 (goals and plans) might also be shared or not. For example, the task definition or goals and plans might be discussed and an agreement is reached (e.g., a shared mental model of the task; Thompson & Fine, 1999). Then these products are shared (*we perspective*). However, it could also be that no agreement is reached, or only partial agreement is reached. In addition, those stages might be skipped in cooperative and collaborative learning. This might result in unshared products of these stages, but an implicit agreement, which would be shared, on these issues could exist also (e.g., because the task definition in the instruction is quite clear, or previous collaborative learning led to a shared understanding of goals and plans). A *you perspective* on these issues would include that a group member knows about the plans, goals and task perception of another group member, but does not share them. As we are talking about products and not about conditions, a *you perspective* would include some kind of helping behavior in stage 1 or 2 for another group member to develop his or her task perception, goals and plans.

With regard to stage 4 (metacognitive adaptations), these products might occur with respect to the current or a future task. As for the current task, products might be shared (*we*

perspective) or not (*I perspective*) and thereby play a role for the mode of regulation. With respect to a future task, whether the group will stay together for a longer period of time or whether it is just one occasion when they learn together makes a difference. If they stay together, a shared product of this phase (*we perspective*) might influence later cooperative and collaborative learning (and serve then as a condition, for example). If the group does not stay together, these adaptations for future tasks are only useful to the individual and will thus play a role as individual cognitive condition they bring to later groups. The latter implies an *I perspective*, whether the several *I perspectives* are the same or not. For both a current and a future task, a *you perspective* again would include a kind of helping behavior for another group member to develop his or her metacognitive adaptations.

Standards in cooperative and collaborative learning. If members of a group have the same standards, we can speak of shared standards. These can be the product of a joint prior stage (stage 2: goal setting and planning), but they could also result from a prior experience of learning together or be implicitly shared without talking about it (*we perspective*). In addition, it is also possible that standards are only partially shared--for example, for one attribute but not for the other, or only to a certain degree, such as when one member wants to be more thorough than another. It is an interesting question in how far standards have to be shared to speak of cooperative and collaborative learning. It is probably necessary for successful cooperative and collaborative learning that standards are being shared.

However, an *I perspective* on standards in the context of cooperative and collaborative learning might also occur. This happens especially when there are individual products as in cooperative learning where work is divided. In the same setting, a *you perspective* on standards could also be relevant: A group member might help another one regulate their operations with regard to his or her standards.

Evaluations in cooperative and collaborative learning. Evaluations are created when products are monitored against standards. In case of a discrepancy, a controlling action can be performed. The *we perspective* on this in cooperative and collaborative learning has been emphasized by authors who advocate socially shared metacognition (e.g., Iiskala et al., 2011) and socially shared regulation (e.g., Vauras et al., 2003). But an *I perspective* is also possible and refers to evaluations that are conducted by an individual. A *you perspective* implies that evaluations are observable for other group members. One group member might be helping another group member to evaluate his or her products. However, this also implies evaluations from the first group member and might therefore result rather in a *we perspective*.

While it is possible to think of evaluations as not being shared even when standards are shared (an *I* evaluating its individual product with regard to some shared group standard), it is much more difficult to think of shared evaluations when standards are not shared. Therefore, we assume that the perspective on evaluations and standards are only in part independent from each other.

COPES in cooperative and collaborative learning. This discussion shows that it is possible to think of COPES components as being shared or unshared in cooperative and collaborative learning. Not only an *I perspective*, but also *we* and a *you perspectives* are applicable to the COPES components in the various stages. It is also largely possible to independently vary the perspective or sharedness, respectively, for each of the components.

We can also see from this discussion that at least some COPES components might not only occur in a purely shared or unshared way, but also that it is conceivable to have a mixture of a shared and unshared features of each component. Products are one example for

this: It is not only possible but probably even common that in collaborative learning both shared and unshared knowledge is acquired. Another example is a set of standards that might be shared only partially or to a certain degree. For the following analysis of regulation terms, however, we chose to apply the perspective and categories of sharedness, respectively, in their pure forms of either shared or individual and *I, we* or *you perspective*, respectively. Cases that fall in between (cases in which there are both shared and unshared products, for example) are more complex and are excluded from further consideration in this paper.

Finally, we point out that it might not be possible to derive from interaction protocols alone whether a COPEs component is shared or not. For example, standards might be shared because of a previous instance of collaborative learning. In the current interaction, there might not be a reference to these shared standards, but they are shared nevertheless. In practice, it therefore might be necessary to take more information into account than only interaction protocols in order to determine the sharedness of the COPEs components.

Terms for Concepts of Social Phenomena of Regulation – Analyzed on the Basis of a Theoretical Framework

To find out how the various terms on social regulation are used in the literature, we searched PsycInfo and Psynindex using the key words *regulat**¹, *metacogniti**, *self-regulat**, *cooperative learning*, *collaborative learning*, *co-regulat**, *other-regulat**, *socially shared*, and *learning* in various combinations (in autumn 2013). These key words had to be part of the abstract, title, key concepts or subject heading field within the database. In addition, we checked the references of key articles and of key authors. Dissertations or conference contributions that were not available were excluded. In a next step, we read the abstracts of these articles to determine their relevance. All articles that did not match the scope of the

¹ The asterisk (*) serves as wildcard. It stands for one or several additional letters.

review sketched in the introduction were excluded. The resulting 53 contributions are listed in the reference list and marked with an asterisk (*). These contributions were read in order to determine which regulation terms were used and how they were defined. We recorded explicit definitions or operational definitions in terms of coding schemes. In all cases, at least a short definition was provided. Table 1 provides an overview of the frequency and definitions of the most common terms. In the following, some but not all definitions are used to exemplify the respective concepts.

With regard to social modes of regulation during cooperative and collaborative learning, regulation terms usually have been differentiated into three different types (e.g., Grau & Whitebread, 2012; Hadwin & Oshige, 2011; Järvelä & Hadwin, 2013). For example, Järvelä and Hadwin (2013) listed *self-regulation*, *co-regulation*, and *shared regulation*. In this conceptualization, *self-regulation* is understood as regulation of oneself towards own goals for the group task, *co-regulation* means support of and by others with regard to own and shared goals for the group task, and *shared regulation* refers to socially shared regulation.

However, there are several other terms that have been used to describe social phenomena of regulation during cooperative and collaborative learning. The most common terms in our literature search were *socially shared regulation*, *socially shared metacognition*, *other-regulation*, *co-regulation*, and *social regulation*. But others such as *interpersonal regulation*, *collective regulation* and *collaborative regulation* were also used. Rarer were the terms *directive regulation*, *task regulation vs. team regulation*, and *internal and external regulation*.

After compiling the terms and their definitions, we used Winne and Hadwin's (1998) model as a framework to analyze the regulation terms. While in SRL all stages and COPES components are (by definition) individual, the question of which component in the stages is shared--that is, the question of which perspective (*I*, *you*, *we*) applies to each of the

components in the stages--can serve as a classifying criterion for understanding the different terms for social phenomena of regulation.

In the following, we will analyze the different regulatory terms and analyze their meaning on the basis of the described extension of COPES. We will focus on stage 3 (enacting study strategies) of Winne and Hadwin's model, because for the differentiation of terms, this seems to be the stage within which all differences emerge. Table 2 summarizes all our analyses and displays in rows all distinct conceptualizations of terms for social modes of regulation (except those that are only used as umbrella terms). Each cell displays whether the respective COPES component (column) is shared or individual and whether it is seen from an *I*, *you* or *we perspective*. An empty cell means that whether this component is shared or not seems not to matter for the definition of the mode in that row.

In addition, we provide an example for each of these modes to illustrate them. The example is derived from Schoor and Bannert (2012); however, we invented the dialogues and changed the setting a bit. We use the same example for all distinct social modes of regulation that we identified and only change the relevant elements to illustrate the meaning of the concepts.

In our example, three university students (Emma, Oliver and Sophia) prepare a joint presentation for a seminar. Their topic is general principles of tests of significance, which they have to teach to their peers in the seminar in the following week. Therefore, they have to prepare a PowerPoint presentation and make sure that all three of them understand the topic well enough to be able to explain it to the others. They have gathered several textbook texts on tests of significance, and each of them has read a different text in order to save time. They have also negotiated the structure of the presentation. Now they work on the content of the slides. One part of the presentation will include the steps one has to do in order to carry out a test of significance.

Our analysis starts with a short description of *self-regulation of learning*, because this is the focus of Winne and Hadwin's model, and the social modes of regulation can be nicely contrasted to individual self-regulation. The classic notion of individual self-regulation is first contrasted to the more social version, which we termed *self-regulation towards group goals*. In sharp contrast to self-regulation, we then discuss *socially shared regulation* and *socially shared metacognition* before we analyze social modes of regulation that are neither self-regulation nor socially shared regulation. We start with *other-regulation* as a prominent term and continue with the equally prominent term *co-regulation* before we turn to the less known *directive regulation of the group*. Then, terms that are either umbrella terms or occur only rarely are discussed: *social regulation*, *interpersonal regulation*, *collective regulation*, *collaborative regulation*, *task vs. team regulation* and *internal vs. external regulation*. After this, social modes of regulation that we derived from our framework and that seem plausible to us are briefly sketched.

Self-Regulation (of Learning) and Self-Regulation Towards Group Goals

Self-regulation might occur during cooperative and collaborative learning, but it is individual and has no social aspect, in contrast to self-regulation towards group goals which will be described below. In self-regulation, all components and stages of Winne and Hadwin's model are individual, in the *I perspective*. We depict this mode of regulation in Table 2, row 1a. Note the difference from Table 2, row 1b – standards are not shared.

In contrast to classic self-regulation as described in the previous paragraph, there is also a notion of self-regulation in cooperative and collaborative learning that refers to group goals (Romero & Lambropoulos, 2011). This differs from self-regulation insofar as goals are shared among the group members – they work for a common goal. However, they do not work jointly on it, but everybody is doing work on his/her own. This is, for example, the

case when the group members divide the work in cooperative learning. In this case, standards (goals are multivariate profiles of standards in COPES) are shared (*we perspective*), but operations and products are individual (*I perspective*), and the regulatory activities (“evaluations” in COPES terms) have to be done by each individual (*I perspective*). Whether conditions are shared depends on the exact group constellation and does not matter for the definition of this mode. Therefore, no assumption is made about the sharedness of conditions in this mode of regulation. Table 2, row 1b illustrates this regulatory mode. Note that the empty cell for conditions refers to the missing assumption with regard to this component.

In our example for *self-regulation towards group goals*, the three students had distributed the work on the slides and are now reviewing them together (cooperative learning). Oliver’s job was to describe the steps in tests of significance.

Oliver I haven’t described well the steps of tests of significance.

Oliver This part is not as understandable as we need it to be for our audience.

Oliver I should rework this slide.

Oliver I think I’ll try and paraphrase them in my own words.

In this example, Oliver regulates his own work (*I perspective* in evaluations). He realizes its weaknesses with regard to the shared goal of compiling a good presentation (*we perspective* in standards), and comes up with controlling actions aiming at improving his work. Therefore, only the overarching goals are shared in this example, both who is regulating and what is being regulated is individual – Oliver.

Whether self-regulation occurs towards group goals or towards own goals might make a difference for how successful cooperative and collaborative learning is. Regulation towards group goals might mirror a sense of commitment to the group. This might help the group work together and eventually lead to more shared modes of regulation. Self-regulation

towards own goals, on the other hand, might be evidence of more individual attitudes of the group members. This might even be correlated with dysfunctional group behavior. However, these are speculations that need future research. The next term, *socially shared regulation*, is construct fundamentally different from self-regulation.

Socially Shared Regulation

The term *socially shared regulation* has been used quite consistently in the literature for a special form of regulation during cooperative and collaborative learning. This form of regulation is “considered the most profoundly social mode of regulation, because it refers to individuals’ metacognitive processes that operate as a genuine social entity, aimed at a single direction, that is, the fully shared goal for the activity” (Volet, Vauras, et al., 2009, p. 219). Vauras et al. (2003) were one of the first authors to describe the phenomenon. They defined it as “constant monitoring and regulation of joint activity, which cannot be reduced to mere individual activity” (p. 35) and “egalitarian, complementary monitoring and regulation over the task” (p. 35). This definition has been taken up by several authors (e.g., Grau & Whitebread, 2012; Volet, Summers, et al., 2009; Whitebread, Bingham, Grau, Pino Pasternak, & Sangster, 2007).

What is defining for this form of regulation is the “we” perspective (e.g., Järvelä & Hadwin, 2013; Whitebread et al., 2007), in contrast to the “I” perspective. While in self-regulated learning, the *I* is the agent of regulation (“I monitor my progress”, “I monitor the progress of the others”), in socially shared regulation, the *we* is the agent of regulation (“we monitor our joint progress”). The group functions as a whole. Regulation occurs “in unison” (Perry & Winne, 2013, p. 46). Regulation in this mode is seen as a group function, the group works as one single entity.

Viewed from a more sociocognitive perspective, this *we* entails that goals (profiles of standards), regulatory activities (cognitive evaluations) and cognitive activities (operations) are shared among the members of a group (cf. Table 2, row 2a). First, it means that regulatory processes like monitoring, controlling, and evaluation are co-constructed (Hadwin & Oshige, 2011; Järvenoja & Järvelä, 2013). This refers to the COPES component of evaluation. In addition, “goals and standards are co-constructed, and the desired product is socially-shared cognition” (Hadwin, Oshige, Gress, & Winne, 2010, p. 801). In COPES terms, the co-construction of goals and standards means that standards are shared, and it also implies a shared stage 2 (goal setting and planning). Socially shared cognition as the desired product refers to a *we perspective* for the products of stage 3. Several definitions emphasize the sharedness of these three components (goals/standards, regulatory activities/evaluations and cognitive outcome/products) (e.g., Hadwin et al., 2011; Järvelä & Hadwin, 2013; Perry & Winne, 2013). For example, Perry and Winne (2013, p. 46f) expressed that “shared regulation of learning implies shared awareness of goals and joint monitoring of progress toward a shared outcome.” As mentioned above, not only products but also activities are shared, therefore the only COPES component that is not mentioned to be shared is conditions. Actually, there is no information about the sharedness of conditions in this mode, which is why this cell in Table 2 remains empty.

We suggest that the term *socially shared regulation* should always refer to this mode of regulation during cooperative and collaborative learning; in this mode, group members share not only goals (standards) and regulatory activities (evaluations) but also cognitive activities (operations) and outcome (products). Table 2 displays this mode of regulation within the COPES framework in row 2a.

In our example, the three students work together on the slides:

Emma We haven’t described well the steps of tests of significance.

- Oliver That's true -- this part is barely understandable.
- Sophia We should rework this slide.
- Emma What if we try and say it in our own words?
- Oliver Yes, let's try this, that's a good idea!

Important in this example is that the students take on a *we perspective* on operations, products, standards, and evaluations. They jointly regulate their joint work. They work collaboratively on their slides so that operations and products are shared. Their standards are shared; they want to give a good presentation with well-prepared slides. They jointly evaluate their product, reach a consensus about it, as well as about remedial steps to improve the slides – all elements of evaluations are shared.

Despite the substantial unity in conceptualizing socially shared regulation, there are a few papers in which this term has been used as an umbrella term to refer to all kinds of regulation that occur during collaborative learning. For example, Järvelä, Järvenoja, and Veermans (2008) included both individual and collaborative regulation within their definition of socially shared regulation. Rogat and Linnenbrink-Garcia (2011, 2013), however, used the term to refer broadly to “social processes groups use to regulate their joint work on a task” (Rogat & Linnenbrink-Garcia, 2011, p. 377) – a definition that covers more than socially shared regulation, which we will see in the following sections (especially those referring to other-regulation and co-regulation).

Socially Shared Metacognition

Socially shared metacognition (e.g., Hurme, Merenluoto, & Järvelä, 2009; Iiskala, Vauras, & Lehtinen, 2004; Iiskala et al., 2011; Molenaar, van Boxtel, & Slegers, 2011; Volet, Vauras, Khosa, & Iiskala, 2013) is a term that has been used interchangeably with the term *socially shared regulation*. Given the overlap of metacognition and self-regulation (cf.

Dinsmore, Alexander, & Loughlin, 2008; Kaplan, 2008; Lajoie, 2008), this is not surprising. For example, Iiskala et al. (2011) defined socially shared metacognition as “consensual monitoring and regulation of joint cognitive processes in demanding collaborative problem-solving situations” (p. 379). They continued: “Socially shared metacognition can be considered the most profound social mode of regulation, because it refers to individuals’ metacognitive processes that operate as a genuine social entity, aimed at a single objective, that is, the fully shared goal of the activity” (p. 379). The parallels to Vauras et al.’s (2003) and Volet, Vauras, et al.’s (2009) definition of socially shared regulation are obvious. Volet et al. (2013) in addition emphasized that in socially shared metacognition, “participants’ regulatory activities are shared and interdependent, with ‘collaboration’ conceptualized as involving symmetry, shared goals, and low division of labor in the interaction” (p. 69).

Thus, for *socially shared metacognition*, just as with *socially shared regulation*, it is necessary that learners share goals (profiles of standards), regulatory activities (evaluations), and cognitive activities (both operations and products) (see Table 2, row 2b). However, there might be a difference with regard to the target of regulation². The term *socially shared metacognition* emphasizes that it is cognition that is regulated, while in *socially shared regulation* the target of regulation might also be motivation or emotion, for example. Therefore, *socially shared regulation* seems to be the broader term, but *socially shared metacognition* is a useful term when focusing on cognition as the target of regulation.

Other-Regulation and Other-Regulation Towards Group Goals

The next terms to be discussed are terms that lie between the extremes of self-regulation and socially shared regulation. The term *other-regulation* has its theoretical roots in the development of self-regulation, especially in the socio-cultural approach. As long as students

² We thank Tuike Iiskala for this insight.

or children are not able to self-regulate (themselves, their learning, etc.) other-regulation can help them. Other-regulation in this sense provides some kind of scaffolding.

Correspondingly, a definitional criterion for other-regulation is often that one participant in collaboration or cooperation has an advantage in knowledge or skills (e.g., DiDonato, 2013; Grau & Whitebread, 2012; Iiskala et al., 2004; Vauras et al., 2003; Volet, Summers, et al., 2009; Whitebread et al., 2007). For example, Vauras et al. (2003) wrote: “At times, when one partner masters a key element of the task but the other does not, a momentary unequal situation arises. In these situations, regulation is best described as other-regulation” (p. 35). In contrast to the developmental understanding of other-regulation, the group members’ being unequal is only temporary. It might be that in the next aspect of the learning task, the formerly other-regulated student suddenly has an advantage of understanding and takes the lead of collaboration (see also the definition by Rogat & Linnenbrink-Garcia, 2011, which emphasizes the temporary predominance of one group member).

Analyzed with regard to COPEs, the situation Vauras et al. (2003) described includes shared goals (standards: *we perspective*). However, because one partner has not (yet) mastered the task, operations and products (cognitive outcome) are not shared (*we perspective*), but are instead under a *you perspective*. The regulation (evaluations) is done by one individual (*I perspective*). The *I* regulates the cognitive operations of a *you* until this *you* arrives at the same cognitive outcome as the *I* for the sake of shared standards. There is no information about conditions; they seem not to matter for the definitions provided for this term. This is depicted in Table 2, row 3b.

It is also possible to define other-regulation without the reference to shared goals. According to Volet, Vauras, et al. (2009), “in other-regulation, a participant’s perceptions and corrective efforts are also based on internal reference values or norms, but focus on another participant’s activity (i.e., other-focused metacognitive awareness – metacognitive

control)” (p. 222). The difference from the former definitions is that the monitoring and controlling is based not on group goals but on individual goals of the regulating individual (*I perspective*). This understanding of other-regulation follows the mode of regulation in Table 2, row 3a, and is not unique to cooperative or collaborative situations – it can also occur when two individuals work individually at the same time at the same task (co-active learning) and one helps the other.

As these two meanings of the term *other-regulation* differ in the sharedness of goals, we suggest that the goals be explicitly referred to within the terms. Therefore, we suggest that the first meaning be termed *other-regulation towards group goals* (see Table 2, row 3b), and that the term *other-regulation* be reserved for the scaffolding meaning of other-regulation with no shared goals (see Table 2, row 3a). These two modes of regulation might imply different predictions about whether the regulated person(s) accept(s) the other-regulation. If goals and standards are shared, acceptance of other-regulation might be more likely, whereas in the context of unshared goals, it might be easier to feel misunderstood. In any event, for the effects of other-regulation on commitment and socio-emotional climate in the group, it might be helpful to differentiate these two modes of regulation.

Other-regulation towards group goals is part of what Järvelä and Hadwin (2013) called co-regulation. It is a mode in which one group member supports another group member in their (individual) work for the shared group goal. In the literature, this mode has been termed other-regulation (e.g., Vauras et al., 2003; Volet, Summers, et al., 2009) or co-regulation (e.g., Winne et al., 2013).

Adapting our example for *other-regulation towards group goals*, the three students had distributed the work on the slides and are now reviewing them together (cooperative learning). Oliver’s job is to describe the steps in the test of significance.

Emma Oliver, we had agreed that we need to phrase things as simply as possible.

Emma What you wrote about the steps of tests of significance is barely understandable.

Emma You should rework this slide.

Emma Try and paraphrase them in your own words.

Oliver You're right; I'll paraphrase it.

Emma regulates Oliver's work. Thus, the cognitive activities that are regulated are Oliver's (*you perspective*), but the regulatory activities are conducted by Emma (*I perspective*). However, Oliver's work contributes to shared group goals (*we perspective*); therefore, this is an example for other-regulation towards group goals. An example from the literature for this mode of regulation can be found in (Grau & Whitebread, 2012, p. 407, Table 5).

If there was no *we perspective* on standards--e.g., if Emma referred to her own standards for slides--it would be a case of *other-regulation*. In the example situation, we assume that there is no prior (implicit or explicit) agreement on standards for the slides:

Emma Oliver, I think you need to describe the steps of tests of significance in much simpler words.

Emma You should rework this slide.

Emma try and paraphrase them in your own words.

Oliver you're right; I'll paraphrase it.

In this example situation, Emma refers to her own standards of describing the steps as simple as possible ("I think you need to..."). Her own standards are the basis of her regulation activity. Note the difference to the prior example for other-regulation towards group goals where Emma explicitly refers to the agreed-upon group goals. There, those

agreed-upon group goals built the basis for her regulation. An example from the literature for this kind of regulation can be found in Hurme and Järvelä (2005, p. 63).

Co-Regulation

Among all the regulation terms, the term *co-regulation* is the one that has been given the greatest diversity of meanings. The term has its theoretical roots in sociocultural theory. Therefore, several authors (e.g., Hadwin & Oshige, 2011; Hadwin et al., 2010; Järvelä & Järvenoja, 2011; Järvelä, Näykki, Laru, & Luokkanen, 2007; Perry & Winne, 2013; Salonen, Vauras, & Efklides, 2005) have defined it with reference to a transitional process from other-regulation (in the sense of scaffolding another person's learning, Table 2, row 3a) to self-regulated learning. For example, Hadwin et al. (2010) stated:

Co-regulation refers to a transitional process in a learner's acquisition of SRL, within which experts and learners share a common problem solving plane and SRL is gradually appropriated by the individual learner through interpersonal interactions. Co-regulation involves a student and other (usually more capable other) sharing in the regulation of the student's learning. (p. 799)

The main idea here is the appropriation of self-regulation by the (co-regulated) student. Cooperation serves to help the student not only to achieve his or her cognitive goals but also to acquire necessary skills for future self-regulation of learning. McCaslin (2009) expressed this very clearly: "One goal of CR [co-regulation] ... is the development of self-regulation" (p. 138).

Closely related to this notion of co-regulation are definitions that emphasize the support of the other's self-regulation but without reference to a development of this other's self-regulatory capabilities (e.g., Järvelä & Hadwin, 2013; Järvenoja & Järvelä, 2009). The aspect of assistance is emphasized, but it is also clear that the regulation occurs with regard to

individual goals, not group goals: “In co-regulation, the individual is seen as seeking to affect others and being affected by others with the intention of achieving their own goals” (Järvenoja & Järvelä, 2009, p. 464). This notion corresponds to the notion of other-regulation as represented in Table 2, row 3a: An individual group member affects or helps others with their operations (*you perspective*) and products (*you perspective*) by regulating or helping to regulate (evaluation – *I perspective*) their activity with regard to their goals (standards – *I perspective*). The difference between the two meanings of co-regulation is the developmental aspect: whether the co-regulation is supposed to lead to self-regulation or not; this difference cannot be expressed in terms of our framework and is therefore not depicted in Table 2.

A different conceptualization with regard to the sharedness of goals in co-regulation is presented by Winne et al. (2013):

Students coregulate learning by temporarily guiding, prompting, or assisting each other to accurately monitor and control cognitive work that contributes to the group product.... Coregulation implies reciprocity - group members assist each other to calibrate or realign one another's metacognition in the service of regulating contributions to the collaborative task. (p. 466)

According to this definition, a single student (*I perspective*) temporarily carries out only metacognitive or regulatory activities. Students share goals (standards), cognitive operations, and products (*we perspective*). This idea is captured by the mode in Table 2, row 4, which we termed *directive regulation towards group goals* and which we will describe in the next section.

A similar definition of *co-regulation* is that of Volet et al. (2013). They defined co-regulation in contrast to socially shared regulation as “other instances of social regulation in which individuals’ contributions to the collective regulatory effort are not necessarily

consensual or do not progress in the same direction” (Volet et al., 2013, p. 70). In this conception, co-regulation refers to all social modes of regulation which are not socially shared regulation. Given that there are several different phenomena of regulation in cooperative and collaborative learning that are not socially shared regulation, *co-regulation* in this sense is an umbrella term.

The use of *co-regulation* as an umbrella term has been quite frequent. Several authors (e.g., Chan, 2012; DiDonato, 2013; Lajoie & Lu, 2012; Liu & Hmelo-Silver, 2010; Volet, Summers, et al., 2009; Winters & Azevedo, 2005) used the term *co-regulation* to refer to all forms of regulation during cooperative or collaborative learning. Note that this conceptualization includes socially shared regulation, which makes this usage of the term co-regulation different from Volet et al.’s (2013). A definition by DiDonato (2013) clearly expressed this: “Co-regulation describes interactions between two or more peers that coordinate SRL processes ...and can vary from other regulation to shared regulation” (DiDonato, 2013, p. 26). Järvenoja, Volet, and Järvelä (2013) more explicitly emphasized in their definition the different purposes these processes might have: "Co-regulation can refer to individuals’ various attempts to affect each other’s motivation, emotional state, cognitive actions, etc. for their own purpose or others’ benefit, or alternatively to coordinate their actions for a shared purpose" (p. 35). This definition emphasizes the different goals that are involved in different modes of regulation during cooperative and collaborative learning. Regulation can occur with regard to one’s own goals (*I perspective*), with regard to another person’s goals (support for their self-regulation, *you perspective*) or with regard to shared goals (*we perspective*).

Some authors have sought to identify an intermediate position between co-regulation as appropriation of self-regulation, on the one hand, and co-regulation as some sort of equal regulation during cooperative and collaborative learning, on the other (e.g., Grau &

Whitebread, 2012; Hadwin et al., 2011; Vauras, Salonen, & Kinnunen, 2008; Volet, Vauras, et al., 2009). In these contributions, a definition with reference to the appropriation notion is combined with shared regulation (e.g., Vauras et al., 2008; Volet, Vauras, et al., 2009), combined with other-regulation (e.g., Grau & Whitebread, 2012) or combined with coordination during cooperative and collaborative learning (e.g., Hadwin et al., 2011).

Singular is the understanding by Romero and Lambropoulos (2011) who use the term *co-regulation* but define it in the same way as Vauras et al. (2003) defined socially shared regulation (even citing these authors).

To sum up: The term *co-regulation* has been defined diversely in the literature. The definitions are so different that some of them are mutually exclusive (e.g., Romero & Lambropoulos, 2011; and Volet et al., 2013). Its origin lies in the sociocultural concept of the appropriation of self-regulation. Therefore, several authors have tried to combine this theoretical background with their more collaboration-related definition which seems to confuse more than it clarifies the term. Therefore, we suggest using this term only for non-equal relationships whose purpose is scaffolding for the appropriation of self-regulation (as in parent-child or teacher-student interactions) but not for cooperative and collaborative learning among peers where no peer has a predominant role all the time. Potentially, *co-regulation* could be used as in Järvelä and Hadwin (2013) or Hadwin and Oshige (2011) as an umbrella term not for all social modes of regulation but for those social modes of regulation that are neither socially shared regulation / metacognition nor self-regulation. However, the modes of regulation covered by this umbrella term might differ from each other not only from a conceptual point of view but also in empirical results and implications. Therefore, and for the sake of conceptual clarity, authors should be aware of the varied past usages of this term and of potential misunderstandings when it is used. A careful definition of the term is warranted if the term is used.

Directive Regulation Towards Group Goals

Directive regulation is a mode that has not been explicitly conceptualized in previous work (e.g., Järvelä & Hadwin, 2013) but which has been found empirically (e.g., Rogat & Linnenbrink-Garcia, 2011). The term has been used--e.g. by Rogat and Linnenbrink-Garcia (2011)--to describe the phenomenon in which one person dominates the regulation of the group process. This is also a form of co-regulation in the sense of Järvelä and Hadwin (2013), but distinct from other-regulation towards group goals in that directive regulation towards group goals assumes shared operations and products, whereas other-regulation towards group goals does not.

In directive regulation towards group goals, both goals (standards) and operations and products are shared (*we perspective*), thus these are good prerequisites for socially shared regulation. However, only one person is regulating the group process (*I perspective* in evaluation, which includes controlling). This person might tell the others what to do next and monitor the goal progress. The others do not join in the regulatory activities so that one person directs the group process. Table 2, row 4, displays this social mode of regulation.

In our example, the three students work together on the slides (collaborative learning).

- Sophia We haven't described well the steps of tests of significance.
- Sophia We should check whether we can't explain it in a better way.
- Sophia Emma, please have a look in your textbook and check whether they, too, describe the steps in such a complicated way.
- Emma Ok. It says: "First, formulate a null hypothesis and construct a commensurate sample distribution."
- Sophia Oh, yeah, this is complicated.

Oliver Doesn't "formulate a null hypothesis" just mean that you express the opposite of what you want to get out in your experiment?

Sophia Yes, that's good, let's write everything in our own words.

Sophia is regulating the group. She evaluates the group's activities and generates controlling actions (*I perspective* on evaluation). The cognitive activities (operations) and outcomes (products) are shared (*we perspective*) and aim at a common goal (standard – *we perspective*). However, both Emma and Oliver rely on her regulation and do not share in the regulatory activities. They only share in the cognitive activities, that is making sense of the steps of tests of significance (co-construction of knowledge). Sophia is the one who decides at a meta-level that rephrasing would be a good strategy to achieve their goal. We can speculate that maybe Emma and Oliver do not know how to regulate the group work, or that they lack the cognitive capacity to do so.

An example from the literature for this mode of regulation is group C in the study of Rogat and Linnenbrink-Garcia (2011, pp. 401-403). In making this interpretation, we assume shared standards in this group. However, Rogat and Linnenbrink-Garcia (2011) attributed Steve's regulation behavior to his perfectionism, which would imply Steve is applying his own individual standards. In this case, the example would be an example of *directive regulation towards own goal*, which is described below in more detail.

What differentiates this mode of regulation from other-regulation towards group goals is the sharedness of operations and products. In our examples, we have assumed that operations and products are either shared (directive regulation towards group goals) or that they are not (other-regulation towards group goals). However, it is sometimes difficult to decide from a mere chat protocol whether a group is working collaboratively (shared operations and standards–directive regulation towards group goals) or whether they have just split the task into sub-tasks (unshared operations and standards – other-regulation towards group goals).

Directive regulation toward group goals might be a good starting point to develop socially shared regulation, but this issue has to be clarified empirically; Rogat and Linnenbrink-Garcia's (2011) results indicate that this mode of regulation had a negative socio-emotional effect on the group. Nevertheless, both considerations speak for conceptualizing this mode of regulation. An additional open question, is, whether in directive regulation towards group goals the whole evaluation process (monitoring, evaluation, controlling) needs to be done by one person, or whether it is enough that the *controlling* is done by one single person.

Social Regulation

The term social regulation has been used unanimously as an umbrella term for modes of regulation during cooperative and collaborative learning (e.g., Grau & Whitebread, 2012; Janssen, Erkens, Kirschner, & Kanselaar, 2012; Järvenoja et al., 2013; Lajoie & Lu, 2012; Rogat & Linnenbrink-Garcia, 2011, 2013; Schoor & Bannert, 2012; Volet, Summers, et al., 2009; Volet et al., 2013; Volet, Vauras, et al., 2009). The authors seem to be aware that *social regulation* covers several sub-categories of regulation. The definitions vary only slightly in how much they elaborate on different modes of regulation that this umbrella term covers and on whether individual regulation during collaborative learning with reference to shared goals is explicitly included (e.g., Schoor & Bannert, 2012) or not (e.g., Volet, Vauras, et al., 2009).

Other Terms Used for Social Phenomena of Regulation

There are several other terms for social phenomena of regulation that are not used as frequently as the preceding. We will briefly discuss them in the following paragraphs.

The term *interpersonal regulation* has been used by Vauras and Volet (2013), who used it as an umbrella term for the social modes of regulation covered in their book.

Unfortunately, the term is not defined once throughout the whole book. The term seems to cover not only the phenomena of regulation which are subject of this paper but also parent-child and other such interactions.

The term *collective regulation* has mainly been used by the work group around Sanna Järvelä (e.g., Järvelä & Järvenoja, 2011; Järvelä, Järvenoja, & Näykki, 2013; Järvelä et al., 2007). They have emphasized the “sharing of regulation processes as collective processes” (Järvelä et al., 2007, p. 72). The underlying concept, however, seems to be the same as *socially shared regulation*.

For Molenaar et al. (2011), the term *collaborative regulation* “refers to the metacognitive activities that are shared among the group members regulating their collective cognitive activity” (p. 788). This definition sounds like *socially shared metacognition*, while Winters and Alexander (2011) and Winters and Azevedo (2005) used the same term as an umbrella term for “the regulatory processes students engage in while they are learning collaboratively” (Winters & Alexander, 2011, p. 410).

There are several more terms that have been used by single groups of authors. For example, Saab, van Joolingen, and van Hout-Wolters (2012) differentiated *task regulation* vs. *team regulation* to refer to the regulation of cognitive activities, on the one hand, and the coordination of the collaboration, on the other hand. Janssen et al. (2012) and Janssen, Erkens, Kanselaar, and Jaspers (2007) made quite similar distinctions. Romero and Lambropoulos (2011) distinguished between *internal regulation*, which refers to the students’ regulation, and *external regulation*, which refers to regulation by the external setting like scaffolding, scripting of collaboration etc.

Plausible Modes Derived from the Framework

Our framework suggests a systematical variation of the *I, you* and *we perspective* on the single COPES components in order to identify additional social modes of regulation. There is some question whether some of these variations exist, but others seem plausible and likely to occur in cooperative and collaborative learning. These are briefly sketched in the following section.

Self-regulation towards other's goals. This mode (see Table 2, row 5) is closely related to self-regulated learning and self-regulation towards group goals. However, standards are neither shared nor individual in the sense of an *I* perspective, but under a *you* perspective. Practically, this means that self-regulation occurs towards another group member's standards. This might happen if a person has no strong self-esteem and wants to please this other person, and it also might happen if standards are not shared and a person adjusts to a single member's standards (be it higher or lower) in their self-regulation although she is not convinced of this standard and does not share it.

Other-regulation towards others' goals. Other-regulation towards others' goals (Table 2, row 6) is closely related to other-regulation towards group goals, but as in self-regulation towards others' goals, standards are not shared in this mode; rather, another group member's standards are used. This might happen if one group member is not able to self-regulate, but others help with monitoring and controlling. This could happen with regard to the helper's standard (other-regulation), but if the standards of the person who is helped are known, it can also occur with regard to her/his standard which might not be shared by the helper (other-regulation towards other's goals). This might lead to sentences like "I know you want your drawings to be perfect, so you might want to redraw this line." In the helper's view,

however, the line might be good enough; but it does not actually meet the person's standards who is helped.

Directive regulation towards own goals. Directive regulation towards own goals (Table 2, row 7a) is closely related to directive regulation towards group goals. In both modes, socially shared operations and products are evaluated by a single group member. However, whereas in directive regulation towards group goals this evaluation occurs with regard to shared standards, in directive regulation towards own goals, evaluation occurs with regard to the evaluator's own goals. This might make a difference with regard to how the other group members feel about the directive regulation of one group member. In the case of shared standards, they might agree and feel relieved of the burden of evaluation, but in the case of non-shared standards, this might have (more) negative socio-emotional consequences (cf. Rogat & Linnenbrink-Garcia, 2011).

Directive regulation towards other's goals. Directive regulation towards other's goals (Table 2, row 7b) is also closely related to directive regulation towards group goals. As with prior modes in this section, only standards are not shared but other's. This mode might be rare, but it could occur if someone monitors the group's joint operations and products not with regard to shared or own standards but with regard to another group member's standard. In the context of directive regulation, the usage of another person's standard might be an act of courtesy: Although a person directs other persons, s/he might feel more comfortable with that when s/he acts according to someone else's wishes (standards).

Shared other-regulation towards group goals. In this mode, goals (standards) are shared (*we perspective*), but focus of the regulation is the work of an individual (operations and products in *you perspective*) contributing to the group goals. We are therefore talking

about cooperative learning or at least about a phase where there is an individual contribution to a common task. If they were regulating their joint work, this would be socially shared regulation as we defined it in this paper. However, as they are regulating the work of an individual, we suggest calling it *shared other-regulation towards group goals*. By definition, this seems to be a mode of regulation that might be more frequent in cooperative learning, while socially shared regulation might be more frequent in collaborative learning. The regulatory activities are done by the whole group and shared as well (evaluations in *we perspective*). Table 2, row 8, illustrates this mode. It can be viewed as a form of co-regulation sensu Järvelä and Hadwin (2013), but also as a form of socially shared regulation in which the target of regulation is not joint work and activities but individual work and activities.

Summarizing Conclusion

For many of the presented regulation terms, the definitions vary considerably from paper to paper. The definitions vary even within single research groups over time. This is understandable, given that the field makes progress in the conceptualization of these terms. A quite large consensus prevails in the literature about the term *socially shared regulation*, but the term *co-regulation is defined* very heterogeneously.

Our analysis based on Winne and Hadwin's model proved suitable for discerning several modes of regulation. In contrast to previous classification approaches, we classified the modes of regulation not on the basis of an overall perspective of regulatory activities but on the basis of differentiating the sharedness of all five COPES components. This approach makes clear that prior approaches tended to see as one unit what the COPES framework refers to as evaluation and standards. Therefore, in prior approaches, this resulted in a unitary classification based on the overall regulatory activities, whereas our approach is

more fine grained and additionally distinguishes whether operations and products are shared or not. It seems that prior approaches focused predominantly on collaborative learning, whereas our approach deliberately includes cooperative learning, as well.

However, not all components and stages of Winne and Hadwin's model were equally important for our classification. First, for the distinction of different social modes of regulation, it did not seem to be important whether task and cognitive conditions are shared or not (though whether conditions are shared or not may influence which mode of regulation is more likely to occur, which remains to be analyzed empirically).

Second, we observed a strong focus on stage 3 (enacting study strategies) in most of the definitions of social modes of regulation. For the the component of operations, however, other stages besides stage 3 might also play a major role. With regard to stage 3 (enacting study strategies), shared (joint) operations refer to collaborative learning. When operations in this stage are shared, study strategies are enacted in a joint way, resulting in co-construction of knowledge (cf. Dillenbourg, 1999; Resnick, 1991; Roschelle & Teasley, 1995; Scardamalia & Bereiter, 2006), negotiation of meaning, and building of a common ground (Clark & Brennan, 1991). Co-construction of knowledge is often also termed socially shared knowledge construction. This latter term shows that in this construct, the social sharedness is also included. However, what is shared in co-construction of knowledge is the cognitive level, but not the meta-level of regulation. Therefore, during co-construction of knowledge, operations and products are shared, but not (necessarily) the standards and conditions, evaluation, monitoring and controlling. As for the other three stages (task definition, goal setting and planning, metacognitive adaptations), shared operations might involve joint work on these products, which might be part of shared or individual regulation and therefore a defining element of different social modes of regulation.

On the basis of our analysis, we suggest distinguishing the following modes of regulation that might occur in cooperative and collaborative learning (displayed in Table 2):

- Self-regulation (no social aspect)
- Self-regulation towards group goals
- Socially shared regulation
- Socially shared metacognition (socially shared regulation whose target of regulation is cognition)
- Other-regulation
- Other-regulation towards group goals
- Directive regulation towards group goals

The reader might notice that in this list there is no term *co-regulation*. We acknowledge that *co-regulation* as a term has been used for more than one mode of regulation in our view, and therefore we suggest dropping the *term* co-regulation (but not the concept) and using instead a term that is clearer in what mode (what concept) is meant, which might be, for example, other-regulation towards group goals, directive regulation towards group goals, or other terms from the list below.

It was apparent from our framework that there might be even more social modes of regulation that could be distinguished by systematically varying which components of Winne and Hadwin's model are seen under a *we* respectively *I* or *you perspective*. In our view, the most plausible of them are:

- Self-regulation towards other's goals
- Other-regulation towards other's goals
- Directive regulation towards own goals
- Directive regulation towards other's goals
- Shared other-regulation towards group goals

We see this list not as final but as a contribution for further discussion.

Open Questions

There remain several open questions after this literature review. Some of them are more theoretical, others have to be resolved empirically. In the following, four critical questions are elaborated.

What is Meant by the Term “Shared”?

Several of the presented modes of regulation draw on the notion of sharedness, and our analysis of the terms heavily relies on its presence or absence in the various modes. In socially shared regulation as the most “shared” mode of regulation, goals and standards, regulatory activities (monitoring, evaluation, controlling) and cognitive activities (operations) and products are shared. But what is meant by the term shared? It is striking that this central concept rarely is defined.

In some definitions of socially shared regulation, the negotiated or co-constructed character of this mode of regulation is emphasized. Therefore, we can conclude that “shared” means negotiated or co-constructed. This would be an explicit kind of sharedness. In some operational definitions, the uptake of a turn is an important definitional criterion for the sharedness of regulation (e.g., Hurme et al., 2009). However, what if there is no uptake of a turn? Can one and the same turn be either other-regulatory or socially shared, depending on whether others continue to work with it?

Moreover, what about the sharedness of goals? Is it necessary for goals to be negotiated (which would imply a shared experience of stage 2 in Winne and Hadwin’s model), if they are to be called “shared”? In the case of cooperative and collaborative learning, when the students receive a task from their teacher, goals might be implicitly shared. The goals might

be defined within the task definition, and there can be an implicit agreement of all group members about them. Doing well in the task also might be an implicit goal of all group members. Is it then necessary that the group members objectively have shared goals, or are subjectively shared goals enough – as long as no problems arise? In the case of difficulties in group work, the group members might realize that they thought they had shared goals, but actually do not. This might trigger an explicit negotiation on them. Therefore, it seems more reasonable to assume a common ground (Clark & Brennan, 1991) as the basis of sharedness. This common ground might be implicit, a result of previous experiences with each other, for example. Or the common ground might be established by a process of negotiation.

Another concept of sharedness stems from group decision making (e.g., Greitemeyer & Schulz-Hardt, 2003; Meier & Spada, 2007; Stasser & Titus, 1985). In this context, knowledge or information is called shared when both partners have the same knowledge (cf. the concept of knowledge convergence; e.g., Weinberger et al., 2007). Shared knowledge is the overlap of the knowledge bases of the partners. In our context, goals might be shared if there is an overlap, if the partners have the same goal or subgoals. However, this notion raises the question whether processes can be shared in this way³. Can processes overlap in the same way as, for example, goals or knowledge can?

Perhaps the concept of shared agency offers a solution to this. Shared agency is a concept from philosophy (e.g., Bratman, 2009) that has been used also in educational psychology (e.g., Damsa, Kirschner, Andriessen, Erkens, & Sins, 2010). It refers to a situation when people act together (Roth, 2011), for example, in painting a house (Bratman, 2009) or performing an outdoor ballet choreography (Searle, 1990). Both could also be done individually, resulting in the same movements: The painters could each have an individual project to paint one wall (Bratman, 2009). The dancers might perform the same movements

³ We thank Anne Deiglmayr for this thought.

if they were not dancing but running to a shelter when it starts raining during a picnic (Searle, 1990). The same overt behavior differs in its sharedness. What has been identified as a central concept in this context is the shared intentionality (Bratman, 2009) or the we-intentionality (Searle, 1990). This shared intentionality could be applied to the process of regulating learning. Instead of the process itself, it might be the *intention* for a process that could be shared or not. This might solve the problem of how to define sharedness of processes. Therefore, shared intentionality might be a suitable definitional criterion for the sharedness of regulation processes.

A question that arises especially when we think about goals or knowledge is whether sharedness is dichotomous (shared vs. unshared) or whether it is gradual (more or less shared). Prior research seems to assume a dichotomy. For example, knowledge might be shared or not, and if not all knowledge is shared, knowledge items can be defined that are shared and others that are unshared. So the solution would be to split up the unit of analysis. However, in the context of our analysis, we would focus not on single items but on the overall knowledge (or on goals overall). Then, a dichotomous view of sharedness would probably categorize knowledge as unshared if not all knowledge units are shared. However, this might misrepresent reality. Therefore, a more gradual view of sharedness might be in order – although other problems might arise, such as questions of thresholds.

A question closely related to the definition of sharedness is whether we can distinguish between modes of regulation at a turn level or only at an episode level. If we want to distinguish modes at a turn level, then we must be able to determine sharedness at the turn level as well. However, it is difficult to determine whether regulation is shared or not when there is only one person involved in the unit of analysis, which is by definition the case when turns or statements are analyzed. Distinguishing social modes of regulation at a turn level would be interesting for studying the changes between social modes of regulation. If it is

possible to differentiate the modes on a turn level, triggering events or activity chains might be identified that provoke the change in regulation. If it is only possible to differentiate the modes on the level of an episode, this is still possible but much more coarse-grained.

Are There Empirically Important Differences Between the Modes of Regulation We Identified and are There Even More Social Modes of Regulation?

A second question is whether the suggested modes of regulation in cooperative and collaborative learning have important empirical differences. Does it matter whether a regulation mode that is not socially shared regulation is directive regulation or other-regulation towards shared goals? Does it make a difference for learning outcomes, motivation, and emotion within the group? If it does not make a difference, distinguishing between those modes as we suggest in this paper would have little benefit. As we indicated above, we think that the different modes of regulation will have consequences, but this question has to be addressed empirically. Possible dependent variables might be the quality of the collaborative processes of the group (e.g., the co-construction of knowledge), the quality of the group product (the group performance), individual knowledge gain, motivation, group efficacy, and so on. However, what might make empirical evidence difficult to obtain is the high probability that different modes of regulation occur with the same groups; for example, a group might be other-regulating at some times, and engaged in socially shared regulation at other times⁴. To single out the effects of a single mode of regulation will be a challenge.

Theoretically, even more distinct modes of regulation are conceivable. On the basis of our theoretical framework it is possible to systematically vary the sharedness of all five COPES components. We have sketched the ones that seemed most plausible to us. These

⁴ We thank an anonymous reviewer for this idea.

modes might be very similar in their effects on the cooperative learning process as the modes described in the literature, but they also might have different effects on the emotional-motivational climate within the group and could therefore hinder learning. Yet, this must still be shown empirically. The above analysis serves to open up possibilities for new empirical studies based.

Another question arising from our analysis of social modes of regulation with the COPES framework is whether the perspective on the *evaluation* and *standards* must be equal in all modes of regulation. This seems to be the case in prior classification approaches. However, the differentiation between the evaluation and standards components in COPES may also apply to cooperative and collaborative learning situations. It might be the case that standards are shared, but monitoring, evaluating and controlling is done by a single person. It is more difficult to imagine a situation where monitoring, controlling and evaluation are shared, but standards against that it is evaluated are not. To make things even more complex, the analysis of directive regulation suggests that it might be worthwhile even to separate the sharedness of monitoring, controlling and evaluation. For directive regulation, it might be important that one person is controlling – monitoring and controlling might even be done in a socially shared way.

Are Some Modes of Regulation More Likely in Cooperative Learning and Others in Collaborative Learning?⁵

By definition, socially shared regulation seems only possible in collaborative learning, at least this is the conclusion we came to during our analysis. Socially shared regulation aims at joint cognitive activity, which is, by definition, collaborative learning. When cognitive activity is not shared, we identified in our analysis other modes of regulation (e.g., shared

⁵ We thank an anonymous reviewer for this idea.

other-regulation). However, it is a matter of empirical analysis whether these modes really are different from each other (see above).

Turning it the other way around, in cooperative learning there is no reason why more individual modes of regulation should be more likely than more shared modes of regulation. However, it is also reasonable that the social setting (e.g. whether it is cooperative or collaborative learning) might play a beneficial or detrimental role for different modes of regulation. These are also questions for empirical investigation.

Are the Social Modes of Regulation the Same for Different Targets of Regulation?⁶

A final issue that is beyond the scope of this review is the question of the *target* of regulation. Winne and Hadwin's model only refers to the regulation of cognition. Motivation, emotion, and the social serve as conditions, although goals (which might be part of motivation) might be the product of regulation. However, motivation regulation (e.g., Wolters, 2003) and emotion regulation (e.g., Gross, 2001; Koole, 2009; Pekrun, Goetz, Titz, & Perry, 2002) constitute independent areas of research that only recently have received greater attention in the context of self-regulated learning, and therefore are not yet covered by Winne and Hadwin's (1998) model. Maybe the regulation of motivation and emotion might be included as additional stages into Winne and Hadwin's model.

Extended to the social, the regulation of group motivation (e.g., Järvelä & Järvenoja, 2011) and emotional climate in the group (e.g., Näykki, Järvelä, Kirschner, & Järvenoja, 2014) is an even younger field of research. Moreover, in the context of cooperative and collaborative learning, the collaboration respectively cooperation itself is discussed as a potential target of regulation. This might cover, for example, communication within the group or behavior regarding the attitude to work like free riding (Kerr & Bruun, 1983). It

⁶ We thank an anonymous reviewer for this idea.

would be worth investigating, however, whether this is distinguishable from regulating motivation and emotion at the group level. Targeting free riding might be a means to ensure the motivation of all group members, and enabling a positive communication style might help a positive socio-emotional climate. Further, regulating these aspects of cooperative and collaborative learning might be as important for successful cooperation and collaboration as regulating cognitive activities, but there is too little empirical research to reach firm conclusions.

Apart from what different targets exist for regulation at the social level, there is also a question of whether the social modes of regulation discussed in this paper are equally applicable to these targets. We would speculate that the *mode* of regulation is independent of the *target* of regulation, just as the stages within Winne and Hadwin's (1998) model vary and with them also the products created, but the cognitive architecture (COPES) remain the same. Yet, this is – again – an issue for further empirical research.

Conclusion

We believe that the research on social regulation would profit from a consistent and clear usage of terms based on a clear differentiation between different social modes of regulation. The present paper is not the first attempt to clarify terminology; for example, both Hadwin and Oshige (2011) and Järvelä and Hadwin (2013) suggested three modes of regulation in the social context termed self-regulation, co-regulation, and socially shared regulation. However, the present paper goes beyond these contributions in two respects. First, we provided a review of actual usage of terms in the literature, whereas Hadwin and Oshige (2011) provided a review of research approaches based on different theoretical perspectives and Järvelä and Hadwin (2013) did more conceptual work with relation to the field of computer-supported collaborative learning. Second, we extended the former approaches

through developing a framework that relates the different modes of social regulation in the literature to a regulation model from SRL research (the model by Winne & Hadwin, 1998). This makes it possible to clearly define where the social comes into play in the different social modes of regulation and to anchor social modes of regulation with regard to self-regulated learning research. In our view, this has proved a suitable approach to understand the respective meaning of terms and to identify whether different terms refer to the same concept, and vice versa. Moreover, this approach opens up a range of new possibilities for theoretical and empirical analysis.

Our paper contributes to the advancement of the field in several ways. First, our theoretical framework contributes to a better differentiation of social modes of regulation insofar as it provides the opportunity to specify on a more fine-grained level what aspects of self-regulation of learning are shared in different social modes of regulation. This can contribute to a clarification of terms. Second, new theoretically plausible modes of regulation arose from our analysis. This can inspire future research on these modes of regulation. Third, if our framework is applied to prior research in the field of social modes of regulation, it attracts attention to the many theoretically relevant respects in which the learning settings vary in these studies. This might inspire future research on whether the difference of these conditions (in COPES terms: different sharedness of conditions, operations, products, standards) is relevant for regulation of cooperative and collaborative learning. In the long run, this can help to identify cases in which sharedness makes a difference for learning success.

Several open questions resulted from this review. Some of them have to be addressed on a theoretical plane, others on an empirical plane. However, we hope that our proposed theoretical classification of terms based on self-regulated learning research has provided clarity to the jungle of regulation terminology and will inspire future research.

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Table 1. Frequency of usage and definitions of regulatory terms

	usage	defined
Socially shared regulation	30	24
Socially shared metacognition	5	5
Other-regulation	17	9
Co-regulation	37	24
Social regulation	13	10
Interpersonal regulation	5	0
Collective regulation	4	3

Table 2. Analysis of sharedness and perspective (I, we, you) per COPES component (with focus on stage 3: enacting study strategies) in different (notions of) modes of regulation in cooperative and collaborative learning

	Conditions	Operations	Products	Evaluation	Standards
Modes found in the literature					
1 a) Self-regulated learning	individual (I)	individual (I)	individual (I)	individual (I)	individual (I)
b) Self-regulation towards group goals		individual (I)	individual (I)	individual (I)	shared (we)
2 a) Socially shared regulation ^a		shared (we)	shared (we)	shared (we)	shared (we)
b) Socially shared metacognition ^a		shared (we)	shared (we)	shared (we)	shared (we)
3 a) Other-regulation		individual (you)	individual (you)	individual (I)	individual (I)
b) Other-regulation towards group goals ^b		individual (you)	individual (you)	individual (I)	shared (we)
4 Directive regulation towards group goals ^b		shared (we)	shared (we)	individual (I)	shared (we)
Plausible modes derived from the framework					
5 Self-regulation towards other's goals ^c		individual (I)	individual (I)	individual (I)	individual (you)
6 Other-regulation towards other's goals ^c		individual (you)	individual (you)	individual (I)	individual (you)

7	a) Directive regulation towards own goals ^{b, c}	shared (we)	shared (we)	individual (I)	individual (I)
	c) Directive regulation towards other's goals ^{b, c}	shared (we)	shared (we)	individual (I)	individual (you)
8	Shared other-regulation towards group goals ^{b, c}	individual (you)	individual (you)	shared (we)	shared (we)

Note. Empty cells mean that this component is no definitional criterion for this mode of regulation.

^a Terms differ in their emphasis on the target of regulation

^b Modes that would have been termed *co-regulation* in the models of Järvelä and Hadwin (2013) resp. Hadwin and Oshige (2011)

^c Modes derived from the systematic variation of *I / we / you perspective* in COPES components that probably occur in cooperative and collaborative learning but have not yet been described in the literature