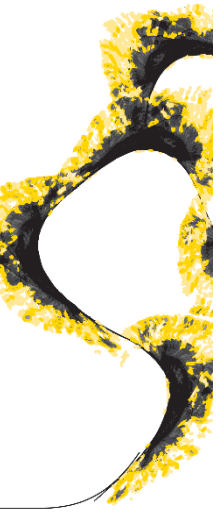

Identifying Socially Shared Regulation of Learning in cooperative learning: A grounded theory approach

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Abstract

Although cooperative learning is an effective instructional method, it can not be taken for granted that students will gain new knowledge while engaging in a cooperative activity. Even if cooperative learning is effectively designed, problems might arise regarding cognitive, behavioral and motivational aspects of learning. For students to gain knowledge from cooperative learning, cognition, metacognition, behavior and motivation should be collectively regulated by group members, which is called Socially Shared Regulation of Learning (SSRL). As students often fail to do this, researchers agree that SSRL should be supported. However, until now it is not clear how SSRL is manifested yet in cooperative learning. First, this study investigated how SSRL is manifested in cooperative learning by means of a grounded theory approach. This was done in order to identify what is necessary for effective SSRL and which consequences it induces. A theoretical model was built in order to portray these prerequisites and consequences of SSRL. Second, this study investigated whether equal participation fostered SSRL. Video data of students of the fourth, fifth and sixth grade of elementary school working together in groups of four was used (n = 104). The data indicated that SSRL is a scarce process, which absence is problematic in some, but not all, situations. Although this study did not find any significant differences in the frequency of occurrence of SSRL between groups who received support on equal participation and groups who did not, differences between SSRL patterns could be observed between these two conditions. Future research should identify how these differences between groups both at group but also at individual level can occur and how to shape effective all encompassing SSRL support.

Keywords: Cooperative learning, Socially Shared Regulation of Learning, equal participation, grounded theory, elementary school

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Introduction

Cooperative learning is an instructional method which is widely advocated in primary education (Jolliffe, 2015). In cooperative learning students work together in small, most often heterogeneous, groups in which students help each other completing a group task in order to achieve a shared goal (Dyson, Linehan, & Hastie, 2010; Slavin, 2010). When students engage in effective cooperative learning this will positively affect their academic outcomes (Slavin, 2015) and they will even outperform students who learn individually (Johnson & Johnson, 1999).

Yet, even if cooperative learning is carefully designed (Kirschner, Sweller, Clark, 2006), problems can arise at the cognitive, motivational and socio-emotional area (Van den Bossche, Segers, & Kirschner, 2006). Challenges at the cognitive area might arise when students experience problems in understanding each other's reasoning. Problems at the motivation area can arise as students might have different learning goals and expectations (Järvelä, Volet, & Järvenoja, 2010). Problems at the socio-emotional area will occur when groups engage in dysfunctional communication which decreases the likelihood of on-task behavior and diminishes task-focus (Barron, 2003). Subsequently, common group goals might not be reached (Järvelä et al., 2016). As the extent to which students establish new knowledge depends on the quality of the aforementioned interactions (Roschelle & Teasley, 1995), students should collectively regulate and adapt cognition, metacognition, behavior and motivation which is called Socially Shared Regulation of Learning (SSRL) (Panadero & Järvelä, 2015). This will guide the team towards better decision making and adapting the cooperative processes, progress, and products which enhances learning (Hadwin, Järvelä, & Miller, 2017). However, research shows that learners are often unsuccessful in regulating their collective learning process (Järvelä et al., 2015). In comparison to individual self-regulation, which is already considered a difficult process for a lot of students (Manlove, 2007), engaging in SSRL calls for additional coordination and communication which might burden working memory (Kirschner, Paas & Kirschner, 2009). This is challenging as each student is an individual self-regulating human-being with personal learning goals, metacognitive strategies and emotions (Järvelä, et al., 2010). In fact, the few students who are capable of self-regulation mostly only regulate their own work without aiming to influence the group (Fernandez-Rio, Cecchini, Méndez-Gimenez, Mendez-Alonso & Prieto, 2017).

As SSRL seems to be an essential skill for effective cooperative learning (Hadwin, Järvelä & Miller, 2011), and as students often fail to engage in SSRL (Fernandez-Rio et al., 2017), researchers agree on the fact that SSRL should be supported (e.g. Järvelä et al., 2016). However, thusfar, researchers have not found a clear-cut way to identify SSRL as a whole yet (Panadero & Järvelä, 2015). As not all aspects of SSRL are sufficiently investigated, it is unclear which aspects need of (which kinds of) support, how important each of these skills are for effective cooperative learning and which conditions are necessary for several SSRL skills to occur. Regarding these conditions, some studies suggest that equal participation might lead to higher levels of regulation in the group (Volet,

Vauras, & Salonen, 2009). However, thus far the effects of equal participation on SSRL in cooperative learning have not been investigated in depth yet.

The aim of this study is first to create an all-encompassing theoretical framework of SSRL which identifies the prerequisites, consequences and relationships between (sub-)processes of SSRL at both the social and task domain. These prerequisites and consequences will in the end underline which conditions are necessary for SSRL skills to occur and how important the occurrence of these skills in fact is. As engaging in SSRL puts a burden on working memory (Kirschner et al., 2009), it would be necessary to indicate whether it is desirable for students to perform these skills so it could be identified whether these skills should be supported. While determining how SSRL is manifested, the current study will investigate the effect of supporting equal participation on SSRL. As SSRL involves processes which concern the group as a whole (Hadwin, Järvelä & Miller, 2011), it is important to determine whether supporting participation of all group members is necessary to evoke SSRL.

Self-regulation

In order to build a theoretical framework of how SSRL is manifested in cooperative learning, it is important to first investigate how individual self-regulation is performed as SSRL is formed by individual self-regulating agents in a cooperative group (Volet et al., 2009b).

When students practice cooperative learning, just engaging in task-related activities is not sufficient for successful collaboration; regulation of task- related activities is necessary as well (Van der Meijden & Veenman, 2005). Self-regulation can be defined as the strategies expert learners use in order to control their cognition, feelings, and actions in order to enhance learning (Zimmerman, 2001). Self-regulation processes are necessary for students to understand, monitor, and direct what they are learning (Wolters, 2003). Self-regulation is considered as a cyclical process, meaning that the feedback from prior experience is used in order to adapt one's prevailing approach (Cohen, 2012). Researchers mostly distinguish between three phases of self-regulation, being planning, monitoring and evaluating (e.g. de Jong, Kolöffel, van der Meijden, Kleine Staarman, Janssen, 2005; Pedaste, Mäeotos, Leijen, & Sarapuu, 2012; Schraw & Moshman, 1995; Torrance, Fidalgo, & García, 2007). These phases should be applied by the learner before, during, and after the task (Cohen, 2012). In the planning phase, students select appropriate strategies, set up learning goals, orient on the problem (Manlove, Lazonder, & de Jong, 2006) and activate prior knowledge (Azevedo & Cromley, 2004). Subsequently, in the monitoring phase, learners continuously analyse information of their learning process and subsequently assess their progress (Ertmer & Newby, 1996). Additionally, they assess comprehension and overall performance and adapt if necessary. In the evaluation phase, learners assess their learning outcome and the learning process (Schraw, Crippen, & Hartley, 2006). Regarding the learning outcome, this typically involves appraising their learning gains (Schraw et al., 2006), learning outcomes and learning goals (Manlove, et al., 2006). For the learning process, generally the virtue of the planning and collaboration are evaluated.

Students who possess high-level self-regulation skills generally perform better in education, achieve higher results, learn with less effort and report higher academic pleasure (Pintrich, 2004; Vauras, Salonen, Lehtinen, Lepola, 2001; Zimmerman, 2000). More specifically, students who have a higher level of self-regulation skills are more skilled than novices in 1) monitoring problem solving, 2) better in esttimating the difficulty of tasks, 3) more aware of mistakes they make in their work, and, 4) are better time-estimators (Matlin, 1994). All in all, self-regulation seems to be an important facilitator of academic achievement.

Socially Shared Regulation of Learning (SSRL)

Apart from just performing regulation strategies individually, regulation strategies should be shared with group members in order to achieve the shared group goal, which is identified as SSRL (Hadwin, et al., 2011). What is essential in SSRL theory and different from theory focused on individual self-regulated learning is that it does not only focus on cognition and metacognition, but also on the reciprocal roles of motivation, behavior, and emotion (Zimmerman & Schunk, 2011) which are considered as the more social aspects of learning. Whereas the previously described processes mainly concern students' skills to regulate learning processes, learning outcomes and task engagement and are therefore predominantly task-focused (Pintrich, Wolters, & Baxter, 2000), regulation of social aspects is also required (Manlove et al., 2006). Social interactions between peers in cooperative learning like giving each other compliments can increase involvement and participation of group members (Abedin, Daneshgar, & D'Ambra, 2012). What's more, social interactions can increase performance and learning satisfaction (Muilenburga & Berge, 2005). Yet, social activities can also be dysfunctional which decreases on-task behavior and diminishes task-focus (Barron, 2003). Therefore, regulation of the social aspects crucial. Resultingly, groups will create or maintain a positive group atmosphere (Kreijns, 2004), which will subsequently increase group members motivation to complete the task (Jehn & Shah, 1997). Although research by Panadero and Järvelä (2015) mentions that regulating these social aspects should be shared among group members, research on regulation in collaborative learning predominantly focusses on regulation of task-related activities (Van der Meijden & Veenman, 2005).

Thus, SSRL involves the regulation of the shared activity, which concerns collectively or interdependently shared regulation processes, knowledge and beliefs in order to achieve a shared goal (Hadwin et al., 2011). When groups engage in SSRL, they generally perceive the task as less difficult (Hurme, Merenluoto, & Järvelä, 2009), and obtain better learning outcomes, than when they do not engage in SSRL or lower levels of shared regulation (Volet, Summers, & Thurman, 2009). However, research by Järvelä et al. (2016) indicates that SSRL is an implicit process. Group members, namely, are mostly unaware of each other's goals, strategies, and knowledge. Additionally, regulating the collaborative process calls for additional coordination and communication, which can overload working memory (Kirschner et al., 2009). As students need support in their self-regulation process

(Järvelä et al., 2014), it is useful to investigate the differences between students when they engage in SSRL and adjust support to their needs. However, in order to do this, one should know how SSRL is manifested. Yet, research on how students share regulation processes is scarce. A review by Panadero and Järvelä (2015) points this out as well, and names some features of SSRL which are not sufficiently investigated yet. First, even though research aims to create encouraging methodological opportunities to measure SSRL, researchers have not yet found a clear-cut way to identify SSRL. This can be attributed to the fact that SSRL research predominantly measures self-regulation in individual context or in the context of collaborative and social activities. Second, a variety of studies measure regulation on a general level, and do not distinguish between the diversity of regulatory processes like setting up goals, and selecting learning strategies (Hadwin et al., 2011). What's more, although SSRL concerns the regulation of both task-related and social activities, researchers often do not focus on the complete picture (Janssen et al., 2012). This therefore calls for an analysis on the complete construct of SSRL (Hadwin, Miller, & Järvelä, 2017). The study by Hadwin et al. (2017) indicates that, when creating a model of SSRL, the researcher should also take into consideration the interplay of the task-related and social activities. Therefore, one should not only focus on domain-related interactions as shared task-regulation can be a consequence of social interactions. For example, if a student perceives task anxiety students in a group can collectively make sure that everyone gets the chance to share their ideas.

Research by Panadero and Järvelä (2015) adds that it is important to take into consideration the difference between co-regulation and SSRL. Sometimes, research uses the term co-regulation when in fact SSRL is described. Co-regulation is considered as a process in which group members regulate each other's learning instead of sharing the regulation process which is what happens in SSRL. Panadero and Järvelä (2015) state that in future research in which new categories for SSRL will be defined, it is important to take into consideration the difference between co-regulation and SSRL in order to create an adequate view of what SSRL entails.

Equal participation

To make learning in cooperative learning more probable to happen, all students need to actively share their knowledge (Vuopala, Naÿkki, Isohätälä, & Järvelä, 2019). This will be reached by ensuring equal participation of group members (Weinberger & Fischer, 2006). Equal participation might also be important for effective SSRL, as the extent to which groups collaborate may construct social regulation processes as they have to co-construct shared understanding and work towards a shared goal (Roschelle & Teasely, 1995). Adjacent to that, when (some) students decide not to collaborate, these processes might not become shared processes. Research by Panadero & Järvela (2015) adds that an important requirement for SSRL to occur is to not have just one expert learner in the group (Panadero & Järvelä, 2015). If just one student is perceived as the expert of the group, other students will blindly follow the expert's advice and regulation strategies will not be shared among group members. Therefore, symmetrical cooperation in which group members are dependent on each

other's information (i.e. positive interdependence) and each individual has to bring information to the group process in order to achieve a shared outcome (i.e. individual accountability) might support SSRL in cooperative learning.

In their study, van Dijk, Eysink & de Jong (2019) created a worksheet which created equal participation in cooperative learning. For the time being, the effect of this worksheet on SSRL was not tested yet. For their worksheet, the principles of the Social Interdependence Theory by Johnson, Johnson & Smith (2007) were utilized. Their theory suggests that the accomplishment of goals is influenced by the act of others. This theory consists of five elements which are all important for a fruitful cooperative process. The first element of this theory is 'positive interdependence', which encompasses group members realizing that their success depends on the success of the other group members. For this to happen, each child should have the opportunity to participate in the group work. If this occurs, helping each other, offering social support, and information sharing will be enhanced (Roseth, Lee, & Saltarelli, 2019).

The second element of the Social Interdependence Theory is 'individual accountability' (Johnson et al., 2007). This entails that each student should be aware of the fact that their individual contribution to the group is essential to reach their shared goals. For this to happen, students should feel the need to participate in the group work which can be fulfilled by giving students their own tasks within the overarching task. Resultingly, the opportunity to engage in social loafing and free-riding will be reduced and equal participation of each student will be enhanced (Laal, Geranpaye, & Daemi, 2013). A method which is frequently used to obtain this objective is the jigsaw method (Aronson, Blaney, Stephan, Sikes & Snapp, 1978). The jigsaw method requires students to first become an expert in one of the few distributed topics. Subsequently, students meet in a group in which each member acquires a distinctive piece of information, which is all needed in order to achieve the shared group goal.

Third, 'face-to-face promotive interaction' implies that students should share information and give each other explanations in order to achieve group goals (Johnson et al., 2007). In order for this to happen, group members should help each other, share information and resources, give feedback, and challenge each other's ideas. In this way, students get to know each other and will learn from giving explanations to their peers (Webb, 1984).

Fourth, for effective cooperation it is important to promote 'interpersonal and social skills' (Johnson et al., 2007). These skills entail among others decision-making, communication and conflict management. For these skills to develop, extensive training is necessary.

The fifth and final element 'group processing' indicates that groups should actively evaluate their group process (Johnson et al., 2007). This consists of evaluation of individual contribution of group members, outcomes of learning goals and improvement for future learning. By engaging in group processing, groups can improve their learning for forthcoming learning situations.

Method

Context of this study

For this study, video data of the cooperative processes of groups of four students was used from research by van Dijk et al. (2019). The aim of their study was to test the effect of supporting the cooperative dialogue on children's domain knowledge and learning process. In their study, elementary school students worked in small heterogeneous groups by means of the jigsaw method (Aronson, et al., 1978). With the jigsaw method, students first worked together in homogeneous expert groups in which they gathered knowledge about one specific topic. In this study, the topics Light & Heat, Oxygen, Water, and Nutrition were treated. Subsequently, students moved to their heterogeneous design group, in which one student per topic was represented. The process of the students working in their design groups was video recorded and used for the aim of the current study. In these groups, students discussed what they have learned in their expert group in order to design a house on the moon which should be inhabited by a family of four. Students in the supported condition were aided by a worksheet which aimed to stimulate equal participation in the group by means of Social Interdependence Theory by Johnson et al. (2007). For the worksheet, see Appendix A. The unsupported condition did not have access to the worksheet. With the video recorded data of these cooperative processes, it was first identified how SSRL was manifested. Additionally, the effect of equal participation was investigated.

Participants

In the study by van Dijk et al. (2019), a sample of 136 fourth, fifth, and sixth grade elementary school children was recruited from six different elementary schools based in a medium-sized city in the Netherlands (60 male, 76 female; M_{age} = 10.95 years, SD = .86, ranging from 8 to 12 years). Based on the CITO's monitoring system, these children were categorized as low-ability, average-ability, or high-ability (CITO, 2012). Subsequently, students were assigned to heterogeneous groups of four students, which consisted of one high-ability student, two average-ability student, and one low-ability student. Within these ability-levels, children were randomly assigned to their group. These groups were randomly assigned to the supported or unsupported condition. Not all video recorded data was useable for analysis as the data of some videos was inaudible. This subsequently led to a final sample of data of 104 students for this study (49 male, 55 female; M_{age} = 10.89, SD = .84, ranging from 8 to 12 years).

Before the start of the study, the children's parents were informed about the aim of this study and gave active consent for their child to participate and for the usage of the data for future research purposes.

Materials

Worksheet

To structure information sharing of the group members in the heterogeneous design groups and to support equal participation, van Dijk and colleagues (2019) designed a worksheet which was given to the students in the supported groups (Appendix A). The worksheet consisted of four steps which were based on the Social Interdependence Theory by Johnson et al. (2007).

In the first step, each student contributed to information sharing about the by him or her studied topic in the homogeneous expert groups. The aim of this step was to create a feeling of responsibility for the whole group's performance (i.e. individual accountability). This was done by giving a hint which stated that children should recall each other's information in the upcoming step.

In the second step, students had to identify two important concepts per topic they were informed by their group members. The aim of the second step was to make children aware of the assets of working together and that they are able to learn from each other (i.e. positive interdependence). The importance of each group member was underlined by challenging the students to mention the most important facets of each other's topics.

In the third step, group members were stimulated to create a list of eight concepts that should be considered to be assimilated in their moon house design.

In the fourth step, the cooperative process was evaluated. The aim of this step was to determine whether everyone agreed with what was written down on the worksheet and whether each topic was adequately treated (i.e. group processing). This was done by making the students sign the worksheet, which indicated that they agreed on the design decisions that were made.

Whereas most aspects of the positive interdependence theory are paired to one of the steps of the worksheet, face-to-face promotive interaction was implemented throughout the whole worksheet. This was manifested as clear references in the worksheet representing the different topics by making use of different colours and symbols. The aim of doing this was to make children mindful about the topics that were to be discussed. Subsequently, students could consult their group members who were representatives of a to be discussed topic. The fifth element of the Social Interdependence Theory, interpersonal and social skills, was not considered in the study by van Dijk et al. (2019) as teaching students these skills should be performed before the cooperative process and this was undesirable for the timespan within which the teachers work.

Concludingly, in the study of van Dijk et al. (2019) the students in the supported condition engaged in more equal participation in the domain-related discourse, gave more domain-related theoretical explanations, and spent more time on coordinating the cooperation than students in the unsupported condition.

Video equipment

To get insight in the process of information-sharing, the cooperative dialogue was videotaped (van Dijk, 2009). Each group was recorded by one video camera accompanied with a Bluetooth-connected microphone. First, the students were given an explanation by the researcher. Subsequently, the students were instructed to say their name in the microphone. From that point on, the data was coded until the point when the students verified to the researcher that they were done with the exercise.

Procedure

Before the data collection took place, the students already participated in four lessons (van Dijk et al., 2019). In the first lesson, the students activated their prior knowledge their heterogeneous design groups about the four topics of the lesson span. This was done by means of an assignment in which they had to write down everything they knew about the topics. In the upcoming three lessons, students worked together in homogeneous expert groups on one of the to them assigned topics. During these lessons, of which each took two hours, students worked together in a digital learning environment in which they worked on exercises individually, in dyads or with the whole group, to obtain information about their topic. The information they gathered from these assignments was clustered in a core assignment.

During the fifth lesson, which was the lesson of which the cooperative process was videotaped, the students returned to their heterogeneous design group in which one student of each topic was represented. The aim of this phase of the lesson was for students to share information about what they have learnt about their topic in their homogeneous group. This information could be used for the design of the moon house in the upcoming lessons.

Data analysis

In order to create theory about SSRL, a grounded theory approach was adopted. This was done by applying Charmaz's constructivist approach (2006), as the aim of this study is to actively develop theory about how SSRL should be identified in cooperative learning. Charmaz makes use of several phases whilst working with her data, being *data collection, initial coding, focused coding, memo writing, theoretical sampling*, *theoretical coding* and, finally *producing substantive theory* by means of a theoretical model. It is important to mention that these phases are not followed synchronously, but are considered iterative processes.

For the initial coding and focused coding phase, video recordings of the supported condition by the study of van Dijk et al. (2019) were coded by means of ELAN software (Sloetjes & Wittenburg, 2008). Before the initial coding phase started, the data in ELAN was already subdivided into segments during the study by van Dijk et al. (2019). These segments were also used for the current study, but were split up in multiple segments when two different patterns of SSRL were shown during one segment. Each segment represented a speaking turn of a specific student and started when a student

started to speak and stopped when another student started to speak, when the student was interrupted, or when a silence of more than two seconds occurred. For each segment, it was identified which of the four students was performing a certain form of SSRL. Making use of the segments is suiting for data which entails fundamental empirical problems (i.e. the measurement of SSRL) as this process allows the researcher to remain open to the data and to observe small nuances (Charmaz, 2006).

For the theoretical coding phase, both quantitative and qualitative data was used. Qualitative data from the observations was used to identify the prerequisites and consequences of certain SSRL skills and to observe differences between the supported and unsupported groups. The latter was substantiated with qualitative data which indicated how often SSRL occurred in both groups. This was done by conducting a one-way ANOVA. For all other phases, only qualitative data was used.

In total 7066 segments were coded which included the video data of fourteen groups whose cooperative dialogue was supported and eleven groups whose cooperative dialogue was not supported. In order to determine interrater reliability, a second coder coded 8.1% (N = 572) of the segments by means of the codes found during the focused coding phase (Table 2). The interrater reliability (i.e. Cohen's Kappa) was considered to be acceptable (k = .73). For the analyses, all segments that were not applicable (i.e. interruptions of the teacher, researcher, or other groups, silences and talk before the start of the assignment) or uncodable were left out, which left 6064 segments for the analysis.

Results

Initial coding

The initial coding process entailed thoroughly studying the data and assigning codes to the transcribed text by open coding (Charmaz, 2006). Creating an initial loose frame is a typical approach for grounded theorists to begin their research with. Sensitizing concepts were used, which are general concepts which give the researcher leading suggestions about which directions to pay attention to and 'sensitize' the researcher to look into these directions. Sensitizing concepts were created by filtering concepts related to self-regulation and SSRL from literature. According to Hadwin et al. (2017), SSRL consists of the categories *metacognition, cognition*, *behavior* and *motivation.* These categories were therefore used as sensitizing concepts. As an addition, for the category *metacognition,* the sensitizing concepts *planning*, *monitoring,* and *evaluating* were used to guide the researcher in developing the first codes regarding metacognition. These codes were derived from theory about individual self-regulation (e.g. de Jong et al., 2005). For the categories cognition, behavior and motivation, no sensitizing concepts were used. In the theoretical sampling phase, it was determined whether the sensitizing concepts could be used as categories for clustering the codes which were found in the focused coding phase. As on- and off-task behavior can be important consequences of the occurrence or absence of certain SSRL skills (Barron, 2003), these codes were also used to identify certain segments. These could subsequently be used in the theoretical framework. Table 1 provides the codes which were found during the initial coding phase. Thereby, examples are provided of students who initiated a certain SSRL activity.

The data used for the initial coding phase consisted of the supported cooperative process of five groups of four students. In total, this sample provided 2258 segments which were coded with ELAN software (Sloetjes & Wittenburg, 2008). After coding five videos, data saturation occurred and the initial coding phase was terminated.

Table 1

Initial coding scheme

Code	**Description**	**Example**
Goal setting	Setting up or discussing goals for the task.	"We need to write down what is important."
Learning strategies	Setting up or discussing learning strategies for the task.	"Maybe it is useful if we already write down things for our moon house."
Task perceptions	Discussing the difficulty of or attitude towards the task.	"This is difficult, so we should take that into consideration."
Time management	Discussing how much time is left.	"We have 35 minutes left."
Collaborative strategies/ planning collaboration.	Arranging task division and assigning tasks to group members.	"Who wants to start?"
Planning task	Arranging which action needs to be performed at a certain point of time.	"Now, we need to sign the paper."
Monitoring task progress	Checking the progress of the task.	"We are at step 3 now."
Monitoring performance	Assessing how well the group is doing.	"We are collaborating very well!"
Monitoring comprehension	Checking comprehension of group members	"How long does day and night take at the moon? Do you know that?"
Evaluating task outcome	Evaluating the outcome of the task	"Do you agree on what is written down on the worksheet?"
Praising person and ideas	Making positive statements about a person or his or her ideas	"You are so thoughtful!" "That is a good idea."

Table 1 (continued)

Inclusion	Encouraging involvement of group members by asking for ideas and involving them in the task	"Which ideas do you have?"
Disrespect	Making negative comments about group members or bullying or annoying them.	"You are so stupid."
Exclusion	Discouraging involvement of group members by criticizing work, ignoring their ideas or not assigning tasks to a specific person.	"I don't care about your ideas."
Stimulating task focus	Stimulating group members to work on the task when group members disengage with the task	"Guys, we need to continue with the task."
Verifying	Asking group members if one's provided information is correct	"A tree makes oxygen, right?"
Asking for clarification	Asking for clarification	"Can you explain that a bit better?"
Consensus building	Agreeing with information provided by group members	"That is correct."
On-task	On-task talk which does not involve forms of regulation but rather concerns information sharing.	"I learned that you need oxygen, otherwise you will suffocate."
Off task	Off-task talk	"You know there is a microphone here right? It records everything we say."

Focused coding

In the focused coding phase, the researcher filters out the codes that make most analytical sense and uses these to code the rest of the data (Charmaz, 2006). These are the codes that are most significant and most occurring. The goal of the focused coding phase is to discover the adequacy of these codes by coding more data. In the current study, codes that were initially added to Table 1 were excluded from the analysis when they were only observed as co-regulation (i.e. the code exclusion) and when the codes were considered as transactivity rather than SSRL (i.e. consensus building and asking for clarification). Also, codes which were considered as similar to other codes were removed (i.e. time management, which was similar to planning task). Hence, crucial concepts which define SSRL and can subsequently be used in order to measure this construct could be identified. As the phases of grounded theory are iterative processes, new sensitizing concepts were added to the list throughout the whole study in order to create a more complete picture of what SSRL entailed in cooperative learning. The coding scheme which was developed in the focused coding phase can be found in Table 2.

Initially, the data of the supported cooperative process of fourteen groups of four students was coded which consisted of 5126 segments. During the theoretical sampling phase, it became clear that data of groups whose cooperative process was not supported would be useful as well. Therefore, the data of the unsupported groups, which consisted of 1940 segments, was also utilized.

Table 2

Focused coding scheme

Code	**Description**	**Example**
Goal setting	Setting up or discussing goals for the task.	"What is the goal of 'together'?"
Learning strategies	Setting up or discussing learning strategies for the task.	"Maybe it is useful if we already write down things for our moon house."
Task perception	Discussing the difficulty of or attitude towards the task	"This is difficult, so we should take that into consideration."
Coordinating collaboration	Arranging task division.	"Who wants to start?"
Planning task	Arranging which action, not specifically assigned to a specific person, needs to be performed at a certain point of time	"Now, we need to sign the paper."
Monitoring task progress	Checking the progress of the task	"We are at step 3 now."
Monitoring task performance	Monitoring how well the group is doing regarding the task	"We already found good aspects for our moon house."
Monitoring group performance	Assessing how well the group is doing regarding collaborative aspects	"We are collaborating very well!"
Monitoring comprehension	Checking comprehension of group members	"Do you understand what I am saying?"
Evaluating task outcome	Evaluating the outcome of the task	"Do you agree on what is written down on the worksheet?"
Praising	Making positive statements about a person's ideas	"You are so thoughtful!" "That is a good idea."

Table 2 (continued)

Inclusion	Encouraging involvement of group members by asking for ideas and involving them in the task	"We also need to listen to Evy." "Which ideas do you have?"
Disrespect	Making negative comments about group members or bullying or annoying them.	"You are so stupid."
Stimulating task focus	Stimulating group members to work on the task when group members disengage with the task	"Guys, we need to continue with the task."
Correcting behavior	Controlling the behavior of group members	"Stop doing that!"
Verifying	Asking group members if provided information is correct	"So is this what we want to do?"

Memo writing

Parallel to the initial and focused coding phases, memos were written which represented the thoughts and annotations of the observations (Charmaz, 2006). For each video a memo was written in order to discover possible codes which could represent SSRL. Hence, categories were elaborated upon, relationships between categories were identified and gaps could be diagnosed. Also, possible connections for the theoretical model were suggested. For an overview of the memos, see Appendix B.

Theoretical sampling

During the theoretical sampling phase, two processes were executed. First, another sample of videos was used to find possible additional codes and to substantiate categories (Charmaz, 2006). For the initial and open coding phases, only data from the supported condition by the study by van Dijk et al. (2019) was obtained. However, throughout theory research, it was believed that for several reasons students might behave differently when they receive cooperative support versus when they do not. First, it was believed that support on equal contribution in the group might contribute to showing SSRL more often than when no support on equal contribution was given (Volet et al., 2009b). Therefore, it was suggested that children in the supported condition would engage in SSRL more often than students in the unsupported condition. Also, giving some sort of collaborative support which increases group awareness diminishes unproductive transactional activities and thereby their cognitive load (Kirschner, Sweller, Kirschner & Zambrano, 2018). Perhaps, students in the supported condition might therefore have more space left in working memory to engage in the transactive processes that

involve SSRL. Therefore, data of groups engaging in cooperative learning whilst their cooperative dialogue was not supported was analyzed as well. This involved data of eleven groups who engaged in cooperative learning without receiving support from the worksheet. In these groups, the children were free in how they wanted to discuss what they have learnt and what they wanted to include in their moon house. When the additional sample was selected, its data was used for the focused coding phase as well. Together, a complete list of concepts could be formulated (Table 2).

Second, together with the data of the supported condition, the data of the unsupported condition was used in order to substantiate conceptual categories and create subcategories. Charmaz (2006) begins theoretical sampling when she has some exploratory categories. Subsequently, properties of the category should be defined in order to create a clear definition of the category. This is done by making use of the memos. Finally, the codes are sorted among the categories and subcategories can be created. This is done by searching for similarities between the codes and categories. In the case of the current study, it was investigated whether the categories that were provided in the definition of SSRL (i.e. metacognition, cognition, behavior and motivation) by Hadwin et al. (2017) could mitigate the codes that were identified during the initial and focused coding phases. Therefore, each of these categories were described in the section below and it was determined whether the codes that were found fit these descriptions. When similarities were found between the descriptions of codes, subcategories were created. First, it was believed that every code suited one of the four categories Hadwin et al. (2017) used to describe SSRL. Second, data analysis showed that some codes came back to the organization of the task, whilst other codes related to the organization of group processes. Therefore, the distinction was made between regulating task-related activities and social activities. In similar matter, research by Janssen and colleagues (2012) also divided codes based on whether they belong to task regulation or regulation of group processes. Within these two groups, subcategories could be created when processes were believed to have overlap or occurred together. In Table 3, the categories and subcategories could be observed. On top of that, codes belonging to these subcategories could be divided in even more concrete categories, whilst considering whether these codes belong to task or group regulation.

In the section below, each category and their subcategories and codes are described. Describing each code is important as research generally does not focus on identifying subprocesses of SSRL (Hadwin et al., 2011). It would therefore be meaningful to describe the meaning of each code in order to clarify how SSRL skills look like. Codes are elaborated upon with examples found in the cooperative processes of the students to illustrate the characteristics of each code. All examples were translated from Dutch. In the examples, students numbered as ‘student 1’ were classified as high-ability, students 2&3 were classified as average-ability and students numbered as ‘student 4’ were classified as low-ability students.

Table 3

The four categories of SSRL, subcategories, and their codes

	Task regulation	Group regulation
Metacognition	*Task planning*	*Group planning*
	Goal setting	Coordinating collaboration
	Task planning	
	Task monitoring	*Group monitoring*
	Monitoring task progress	Monitoring group
	Monitoring task performance	performance
	Monitoring comprehension	
	Task perceptions	
	Task evaluation	
	Evaluating task outcome	
Cognition	*Verifying*	
	Learning strategies	
Behavior		*Positive social interaction*
		Inclusion
		Negative social interactions
		Disrespect
		Correcting behavior
Motivation	Task motivation	
	Stimulating task focus	
	Praising	

Metacognition

As could be derived from theory already, metacognition is one of the categories that identifies SSRL (Hadwin et al., 2011), and involves metacognitive planning, monitoring, and evaluating (e.g. de Jong et al., 2005). The codes that were discovered in the current study for the category metacognition also belonged to one of these three categories.

Task planning

The first code attributed to the subcategory task planning is *goal setting*. In the current study, this always entailed the group creating shared task goals together. Goals about cooperation were not

discussed in any group process. According to Pintrich (2004), goal setting is a process which occurs in the forethought phase of self-regulation. However, goal setting was occasionally observed throughout the course of the task. As the task contained four steps, it also occurred that goals were set when the students were about to start the upcoming step. Additionally, students discussed and created shared goals when the goal was unclear. An example of goal setting could be observed below. The group initiated to start with the step 'together' of their assignment. Student 2 wondered what the goal of that assignment was.

Student 2: "What is the goal of 'together'?"
Student 1: "That we need to come up with an idea together."
Student 2: "Okay, shall we decide that the owner of the assignment can write down what we do together?"
Student 1 & 3: "Yes."

Figure 1: Example of goal setting

The second code for the subcategory task planning is also called *task planning*. This entails creating a shared planning for the task in which the group members agree on which tasks should be executed at a particular point of time. In the provided example, student 4 thinks it is more suitable to do the step 'together' at the end of the exercise. The other group members agree on doing this.

Student 1: "We also need to do the step 'together' don't we?"
Student 4: "What we think is suitable for together, but we will do that in the end. Is that okay?"
Student 1: *Nods*
Student 3: *Nods*

Figure 2: Example of planning task

Group planning

At the group area, the code *coordinating collaboration* could be identified for the subcategory planning. This process entails that the group decides together who works on certain tasks and in which order. This happened at the beginning of the exercise, but also throughout the exercise as the exercise contained several steps. Also, throughout the exercise students occasionally realized that coordinating collaboration was necessary when they were not working in a specific order and chaos occurred. In the example below, the students discussed at the beginning of the cooperation who should start explaining what they have learnt throughout the lesson series.

Student 3: “Who wants to start?”
Student 2: “Me, because I said my name first.”
Student 1: “In that case *name student 4* is going to start, because she said her name in the microphone the latest.”
Student 3: “Can I go first? No just kidding, *student 4* you can go first.”
Student 2: “Okay, I will sacrifice myself, you can go first

Figure 3: Example of coordinating collaboration

Task monitoring

Four codes could be identified which fit the category task monitoring, being monitoring task progress, monitoring task performance, monitoring comprehension, and task perceptions. Research by Rogat and Linnenbrink-Garcia (2011) which identified categories for Socially Shared Regulation in collaborative mathematical problem solving found three codes within the category monitoring which are similar to monitoring progress, comprehension and task perceptions (in their article called monitoring progress, content monitoring and monitoring plan respectively). Monitoring performance was not observed in their study.

The first code for the subcategory monitoring at the task sphere is *monitoring task progress.* This entails students monitoring together which (parts of the) tasks they already performed and what should still be performed. In the example below, student 4 realizes that the group still needs to discuss their ideas for the moon house. When this happens, student 1 monitors the task as well, and confirms that they are at the point at which the step ‘together’ should be performed. Student 2 looks at the task as well and confirms they should continue with step ‘together’.

Student 4: “Okay, together. What do we have to do at ‘together’?”
Student 3: “*Name student 2*, name something we can do together.”
Student 4: “We still have to come up with ideas together.”
Student 1: “ Together…”
Student 2: “ Yes, together.”
Student 2: “Why do you only mention my name? We all have to write something down.”

Figure 4: Example of monitoring task progress

The second code for the subcategory task monitoring is *monitoring task performance*. This entails students monitoring together how well they are handling the task or the quality of provided information. At a given point in time, a group monitors the quality of their provided answers together. The best answers were to be used in the discussion about what should be included in the moon house.

Student 1: “To be honest, I believe the answer about Water, provided by *name student 4* is the best answer. When you purify water…”
Student 3: “And the answer of *name student 2*?”
Student 4: “What is this?” *Shows something to student 3*
Student 1: “Without water, you can suffer from dehydration.”
Student 4: “Yes, I think my answer is the best answer too.”
Student 1: “Yes, but I also chose an answer of *name student 2* because *name student 3* said so.”
Student 4: “*name student 2*, do you want yours to be in there as well?”

Figure 5: Example of monitoring task performance

The third code for the subcategory task monitoring is *monitoring comprehension.* This entails students monitoring together whether they understand the task or explanations given by other students. An example of such a situation is provided below

Student 1: “Imagine, the light comes up and you are tired. It is night for a big amount of time. Do you understand that?”
Student 2: “Yes” *Nods*
Student 3: “Yes, I understand that.”

Figure 6: Example of monitoring comprehension

The fourth code of the subcategory task monitoring is *task perceptions*. This entails students monitoring their shared attitudes towards the task. During the cooperative process of a group, one student shares her perceptions towards the tasks and decides to ask the others about their task perceptions as well. In the end it became clear that the students shared their task perception, namely, they all liked the task. In Figure 6 an example of such an exchange between two students of the group is provided.

Student 4: “I learnt things about the food chain and about the five food groups.”
Student 2: “Did you like to learn about food and the five food groups?”
Student 4: “ “*uncodable*. Yes I did.”
Student 2: “Well uhm. I liked it…”
Student 1: “It’s *name student 2*!”
Student 2: “ Yes it’s me! I liked… What is it called again…”
Student 3: “What is your subject?”
Student 2: “My subject was oxygen. I liked it and I learned a lot from it, but the test went very bad.”

Figure 7: Example of task perceptions

Group monitoring

At the group sphere the code *monitoring group performance* could be identified for the subcategory group monitoring. This code entails assessing how well the group is functioning throughout the execution of the task. During the cooperative process of one group, the teacher interrupts the class because they are speaking too loudly. Student 1 is clearly disappointed, as he believes the group was just engaging in a fruitful cooperative process.

Teacher: “You are making way too much noise. Within five to seven minutes we will leave to the middle place of the school. Until we do that, I want you all to be quiet.”
Student 1: “Ahh… but we were just collaborating so well.”
Student 4: “Hmhm.”
Student 3: *Nods*

Figure 8: Example of monitoring group performance

Task evaluation

For the subcategory evaluation, only the code *evaluating task outcome* could be identified at the task sphere. This code entails students evaluating at the end of the task whether they are satisfied with the outcome. However, it should be noted that throughout the whole coding process it became clear that evaluation of the task-outcome is a very superficial process in SSRL. No processes could be observed where the group evaluated the task outcome on a deeper level (i.e. giving arguments about what is (in)correct and why and how this can be improved in a future setting) than just looking back at the task and saying that they agree on what is written down. Besides, research by Lee (2014) found that evaluation could also encompass shared visions on whether group goals are reached. However, this is not observed in the current study. In a certain situation, the group is about to finish the task.

Before signing the paper, student 1 asks the other students whether they agree with what is written down on the worksheet.

Student 1: “Do we agree on everything?”
Student 3 to student 2: “I am from the moon.”
Student 2: “Yes I agree.”
Student 1: “Do we agree on all our answers?”
Student 3: “Step 4: Sign the paper.”
Student 1: “Do agree on all answers? If we agree on everything we have to sign the paper.”

Figure 9: Example of evaluating task outcome

Cognition

The second category that SSRL entails is cognition. This category involves cognitive strategies learners apply in order to develop shared knowledge and beliefs. The category cognition consists of two cognitive strategies at the task sphere. No categories at the group sphere were observed.

Verifying

The first code which was observed during the coding process was *verifying*. This entails discussing about whether one’ s provided information is correct and subsequently building shared knowledge and understanding. In the situation described below, the group was discussing about whether or not they needed a rocket for their moon house. Student 1 sets up a cognitive strategy in order to create agreement regarding this issue. Namely, he asks his group members to raise their hands if they agree on bringing a rocket to their moon house.

Student 1: “We shouldn’t think in a difficult way. We should go for a rocket.”
Student 4: “Okay”
Student 1: “Raise your hand if you want a rocket.”
Student 1: [Raises hand]
Student 1: “I really want a rocket.”
Student 3: [Raises hand]
Student 4: [Raises hand]

Figure 10: Example of verifying

Problem solving strategies

The second cognitive strategy which could be observed was problem solving strategies. This entails learning strategies students share in order to approach a shared problem and subsequently

create shared beliefs. These learning strategies varied from getting additional materials like extra sheets of paper to explain things better to their peers to a voting system to determine the best ideas for the moon house. Learning strategies were typically used as a form of problem-solving strategies, as learning strategies were negotiated when a group experienced difficulties or when they wanted to make the task easier for themselves. An example of a problem-solving strategy can be observed below. Student 4 suggested that they could write down things together in order to make the task easier.

Student 4: "Shall we write this down together?
Student 2: "Yes you can."
Student 1: "Yes."
Student 3: "Yes, but I am not going to write. I can't do that."

Figure 11: Example of problem-solving strategies

Behavior

The third category that was identified during the coding process was *behavior*. This entails regulating the behavior of group members in order to create shared knowledge. However, for this category it was difficult to find examples of shared regulation of behavior. Regulation of behavior was in almost every case co-regulated rather than socially shared. Thereby, it was wondered whether, for example, including students in the group work together would have an added value over one student including another student as the effect in both situations would be the same: All students would be included in the groupwork again and they could continue working on their shared goals. However, in order to stay true to the definition of SSRL, which concerns shared regulation strategies instead of one student regulating other students (Panadero & Järvelä, 2015), only regulation of behavior that was shared among group members was taken into consideration in this study.

All in all, the category behavior consists of four codes at the group sphere. These codes could be divided among two subcategories, being positive social interactions and negative social interactions. Research by Rogat and Linnenbrink-Garcia (2011) indicated that active listening and group cohesion are aspects of positive social interactions as well. However, in this study it was considered that active listening is difficult to observe and therefore it was not included in the coding scheme. They described group cohesion as "Conveying that the group functions as a team (rather than as individuals) by working together, referring to the group as "we"" (p. 384). As the current study deals with cooperative learning in which working together is necessary in order to achieve a shared goal (Slavin, 2010) and non-cooperating groups were not observed, group cohesion was not included in the coding scheme.

Positive social interactions

The code which could be identified as positive social interaction is *inclusion.* This entails involving group members in the group process when group members are curious about the input of others, when a person does not engage in the task, or when a group member excluded or disrespected by other group members. During the process of one of the groups, student 4 was about to explain to her group members what she had learned about Nutrition. However, the whole group was not listening to her and student 3 engaged in off-task talk. Student 2 decided that the group should stop taking about other stuff and listen to student 2. The rest of the group agreed on doing that.

Student 3: "You did not fill in everything. Oh wait you did. I thought you did not"
Student 1: "She did not fill in everyting. If you do not know the answer, it's okay."
Student 3: "Toooooot toooot."
Student 2: "Let that girl speak!"
Student 1: "Yes, first the girl has to speak."
Student 3: "Yes, keep calm"
Student 4: "Okay what you need to preserve food at the moon?"

Figure 12: Example of inclusion

Negative social interactions

The first code which could be identified as negative social interaction is *disrespect.* This entails making negative comments about group members, bullying or annoying them. Disrespect occurred as negative remarks about a person, or as negative remarks about content related issues. The latter does not involve substantiated disagreements, but attacking the input of others which involves making fun of the input of a student or criticizing input by calling it, for example 'stupid'. An example of this could be observed during the cooperative process of group 21. Student 4 seems to be very motivated to work on the task. Student 3 seems not very motivated to work on the task, and starts to make fun of student 4 and teases her.

Student 4: “Okay *name student 3*, what do you think … how much kilograms of water and food do we need?
Student 3: *looks at student 1* *giggles*
Student 4: “What’ s so funny about that?”
….
Student 3: “I am a moon!”
Student 4: “I am also a moon!”
Student 3: “I don’t know but….you have dyslexia?”
Student 1: “Oooof….”
Student 4: “I don’t care!”

Figure 13: Example of disrespect

The last code which could be identified as regulating negative social interaction was *correcting behavior*. This entails commenting on the inappropriate behavior of group members in order to make them stop with that inappropriate behavior. This was observed when one of the groups was engaging in off-task talk. Student 2 mentioned that the group should stop talking and they should continue with the task. Student 1 was playing with a pen. Student 2 wanted this to stop and corrected the behavior of student 1.

Student 2: “We need a cable car.”
Student 3: “AUCH!” *throws away pen which gives electrical shocks*
Student 3 to student 4: “Haha it doesn’t work I am just kidding. You were shocked, weren’t you?”
Student 4: *throws pen towards student 1*
Student 1: *makes noices* *plays with pen*
Student 2: “Hello?! *shouts name of student 1*”
Student 1: *makes noices*
Student 2: “*Shouts name of student 1* Stop!”
Student 4: “We also need to take protected animals because if we take those to the moon they won’t be shot.”

Figure 14: Example of correcting behavior

Motivation

The last category which was identified during the coding process was motivation which is a key factor in self-regulated learning according to many researchers (e.g. Schunk, 2005). Throughout the coding process it became clear that in a cooperative setting, students find strategies to motivate

group members together. Just as for the behavior category, for the motivation category the discrepancy between co-regulation and SSRL was not clear for all codes.

All in all, the motivation category consists of two codes at the task sphere. Codes at the group sphere were not found for the motivation component. Therefore, these two codes can be clustered together under the subcategory task motivation.

Task motivation

The first code which could be classified under the task motivation is *stimulating task focus.* This entails students motivating other students to engage with the task, mostly when they perform off-task behavior. This could involve verbally showing that a peer should engage with the task again, mentioning that a student should do his or her best, or encouraging the student to tell the answer. In the example provided below, the teacher asked the students how they were doing. All students talked at once and the teacher left. They students decided together that it was time to talk one after another and continue with the task.

Student 3: "Give my pencil!"
Teacher: "How are you keeping up with the task?"
Student 2: "We are…."
Student 1: "We only did CO_2"
Student 4: "I am done!"
Student 1: "Carbon dioxide."
Student 2: "I have…."
Student 1: *Ticks loudly on the table with his pencil* Guys!!"
Student 2: "Order, attention!"
Student 3: "Order!"
Student 2: "Thank you. I learnt about oxygen…"

Figure 15: Example of stimulating task focus

The second code for task motivation is *praising.* In the example below, student 3 informed his group members about his topic, water. When he was finished telling about his topic, student 1 decides that it is time to praise him for his contributions to the group.

Student 3: “What do you need in your moon house in order to store water? A water tank!”
Student 1: “This was *name student 3*’s lecture. We should clap for him!
Student 2: *claps*
Student 4: *claps*
Student 1: *claps*
Student 4: “And for me!” *claps*
Student 2: “And for me!”
Student 1: “Clap for student 2 and student 4!”

Figure 16: Example of praising

Theoretical coding

Now the codes and categories are elaborated in the theoretical sampling phase, it was determined how the codes and categories related to each other (Charmaz, 2006) and to what extent they occurred. In order to determine relationships between categories, Charmaz (2006) makes use of analytic categories. As this study aims to explore how SSRL is manifested, how these behaviors relate to each other, and under which circumstances they are performed analytic categories *conditions* and *consequences* were used. Conditions and consequences were determined by making use of the memos (Appendix B). For conditions, it was described how codes were presented under several conditions and which processes were necessary for certain categories to occur. When a difference in the manifestation of a certain category between the unsupported and supported condition was observed, this was described. For consequences, it was described what typically happens after a certain pattern of behavior was displayed. Also, the importance of categories was underlined by describing what happened when a certain category was not performed by the group. Additionally, it was determined to what extend the codes and subcategories (Table 4.1. and Table 4.2. respectively) of SSRL occurred. Additionally, it was determined how often the codes and subcategories were shown in relation to the other codes and categories (Table 5.1 and Table 5.2. respectively) in the supported and unsupported condition.

Table 4.1

Mean scores, percentages, standard deviations and minimum and maximum scores of SSRL and Co-Regulation per code

(Sub) category	Code	M_{group}	SD	Groups performing behavior (%)	Ratio to total amount of codes (%)	Min	Max
Socially Shared Regulation of Learning							
Metacognition	Goal setting	.96	1.64	42.3	.43	0	7
Planning	Task planning	1.77	2.18	57.7	.66	0	7
	Coordinating cooperation	2.27	5.24	53.8	1.02	0	27
Total Planning		**3.69**	**6.98**	**61.5**	**2.11**	**0**	**35**
Monitoring	Monitoring task progress	2.38	2.86	65.4	1.20	0	9
	Monitoring group performance	.04	.20	3.8	.02	0	1
	Monitoring task performance	.35	.56	30.7	.15	0	2
	Monitoring comprehension	.31	.88	15.4	.13	0	4
	Task perceptions	.46	1.5	11.5	.2	0	7
Total Monitoring		**3.46**	**4.04**	**69.2**	**1.7**	**0**	**14**
Evaluating	Evaluating task outcome	.15	.78	3.8	.07	0	4
Total Evaluation		**.15**	**.78**	**3.8**	**.07**	**0**	**4**
Total Metacognition		**7.31**	**10.00**	**88.5**	**3.88**	**0**	**49**

(continued)

Category	Code	M_{group}	SD	Groups performing behavior (%)	Ratio to total amount of codes (%)	Min	Max
Cognition							
	Learning strategies	1	1.44	42.3	.43	0	4
	Verifying	.85	1.64	42.3	.41	0	8
Total Cognition		**1.85**	**2.60**	**53.8**	**.84**	**0**	**10**
Behaviour	Inclusion	.23	.59	15.4	.01	0	2
	Disrespect	.15	.46	11.5	.07	0	2
	Correcting behavior	.12	.33	11.5	.05	0	1
Total positive social interaction		**.23**	**.59**	**15.4**	**.01**	**0**	**2**
Total negative social interaction		**.27**	**.67**	**15.4**	**.12**	**0**	**2**
Total Behavior		**.5**	**.91**	**26.9**	**.13**	**0**	**3**
Motivation	Stimulating task focus	.42	.81	26.9	.18	0	3
	Praising	.01	.39	3.8	.03	0	2
Total Motivation		**.5**	**.86**	**30.8**	**.21**	**0**	**3**

(continued)

Category	Code	M_{group}	SD	Groups performing behavior (%)	Ratio to total amount of codes (%)	Min	Max
Co-regulation							
Metacognition	Goal setting	.58	1.03	34.6	.25	0	4
Planning	Task planning	.96	1.43	38.5	.48	0	4
	Coordinating cooperation	8.23	6.26	96.2	3.46	0	27
Total Planning		**9.77**	**6.94**	**100**	**4.19**	**1**	**29**
Monitoring	Monitoring task progress	2.5	2.35	84.6	1.1	0	11
	Monitoring group performance	0	0	0	0	0	0
	Monitoring task performance	.92	1.52	46.2	.38	0	6
	Monitoring comprehension	.65	.89	42.3	.28	0	3
	Task perceptions	.27	.60	19.2	.12	0	2
Total Monitoring		**4.35**	**3.99**	**84.6**	**1.88**	**0**	**16**
Evaluating	Evaluating task outcome	.04	.2	3.8	.02	0	1
Total Evaluation		**.04**	**.2**	**3.8**	**.02**	**0**	**1**
Total		**14.15**	**10.08**	**100**	**6.09**	**1**	**43**
Metacognition							

(continued)

Category	Code	M_{group}	SD	Groups performing behavior (%)	Ratio to total amount of codes (%)	Min	Max
Cognition	Learning strategies	1.27	1.59	53.8	.58	0	5
	Verifying	2.27	2.32	69.2	1.01	0	8
Total Cognition		**3.54**	**2.66**	**76.9**	**1.59**	**0**	**8**
Behaviour	Inclusion	1.58	1.88	65.4	.78	0	8
	Disrespect	3.85	5.71	61.5	1.58	0	23
	Correcting behavior	3.46	3.31	73.1	1.5	0	10
Total positive social interaction		**1.58**	**1.88**	**65.4**	**.78**	**0**	**8**
Total negative social interaction		**8.34**	**7.18**	**92.3**	**3.08**	**0**	**28**
Total Behavior		**9.92**	**8.10**	**92.3**	**3.86**	**0**	**30**
Motivation	Stimulating task focus	2.38	3.72	61.5	1.04	0	17
	Praising	.88	1.53	38.5	.36	0	6
Total Motivation		**3.88**	**4.90**	**80.8**		**0**	**23**
On-task					55.29		
Off-task					25.94		

Note: The groups performing (%) is compared to the total amount of groups (N = 26). The ratio to total amount of codes is computed as the percentage of the total amount of codes (N = 6064)

Table 4.2.

Mean scores, percentages, standard deviations and minimum and maximum scores of SSRL per subcategory

Category	M_{group}	**SD**	**Groups engaging in this behavior (%)**	**Proportion to total amount of codes (%)**	**Min**	**Max**
Task planning	2.73	3.00	69.2	1.17	0	11
Group planning	2.38	5.29	57.7	1.03	0	27
Task monitoring	3.5	4.02	65.4	1.51	0	14
Group monitoring	.04	.20	3.8	.02	0	1
Task Evaluation	.15	.78	3.8	.07	0	4
Problem solving strategies	1	1.44	42.3	.43	0	4
Verifying	.88	1.66	42.3	.38	0	8
Positive social interactions	.23	.59	15.4	.09	0	2
Negative social interactions	.27	.67	15.4	.12	0	2
Task motivation	.5	.86	30.8	.22	0	2

Note: The groups performing (%) is compared to the total amount of groups (N = 26). The ratio to total amount of codes is computed as the percentage of the total amount of codes (N = 6064)

Table 5.1

Mean proportional contributions (%) to SSRL per code

	Supported		Unsupported		Total	
	M	SD	M	SD	M	SD
Goal setting	0,45	0,72	1,71	3,16	1,04	2,25
Planning task	1,11	0,83	1,07	2,99	1,09	2,07
Coordinating cooperation	1,48	2,60	1,50	2,31	1,49	2,42
Monitoring task progress	1,56	1,09	0,85	1,26	1,24	1,20
Monitoring task performance	0,19	0,25	0,43	1,00	0,30	0,69
Monitoring comprehension	0,21	0,44	0	0	0,11	0,33
Task perceptions	0,27	0,75	0,43	1,49	0,34	1,12
Monitoring group performance	0	0	0,21	0,74	0,10	0,50
Evaluating task outcome	0,11	0,40	0	0	0,06	0,30
Learning strategies	0,65	0,62	0,43	1,00	0,55	0,80
Verifying	0,54	0,78	0,43	1,00	0,49	0,87
Inclusion	0,11	0,23	0,43	1,48	0,26	1,01
Disrespect	0,08	0,22	0,21	0,73	0,14	0,52
Correcting behavior	0,05	0,14	0,21	0,74	0,13	0,51
Stimulating task focus	0,30*	0,37	0*	0	0,16	0,30
Praising	0	0	0,43	1,48	0,20	1,00

*. The mean difference is significant at the .05 level

Table 5.2

Mean proportional contributions (%) to SSRL per subcategory

	Supported		Unsupported		Total	
	M	SD	M	SD	M	SD
Task planning	1,56	1,16	2,78	4,95	2,12	3,44
Group planning	1,48	2,60	1,50	2,31	1,49	2,42
Task monitoring	2,24	1,51	1,71	3,15	1,99	2,37
Group monitoring	0	0	0,21	0,74	0,10	0,50
Task evaluation	0,11	0,40	0	0	0,06	0,30
Problem solving strategies	0,65	0,62	0,43	0,10	0,55	0,80
Verifying	0,54	0,78	0,43	0,10	0,49	0,87
Positive social interactions	0,10	0,23	0,43	1,48	0,26	1,01
Negative social interactions	0,13	0,28	0,43	1,48	0,27	1,02
Task motivation	0,30	1,02	0,43	1,48	0,35	1,02

*. The mean difference is significant at the .05 level

Metacognition

The aim of using metacognitive strategies is for students to understand, monitor and control what they are learning (Wolters, 2003). Overall, most of the groups applied metacognitive strategies like planning, monitoring, or evaluating (88.5% of the groups, M = 7.31, SD = 10.00). The large standard deviation indicates large differences between groups. Some groups frequently performed metacognitive strategies whilst other groups did not engage in any metacognitive strategy.

Task planning

More than half of the groups engaged in task planning (69.2% of the groups , M = 2,73, SD = 3.00). Despite the fact that no significant difference was observed between the supported and unsupported condition regarding the frequency of occurrence of SSRL (F (1, 24) = .798, p =.381), different patterns could be detected in the unsupported condition. When students in the supported condition created a shared planning, students adhered to this planning throughout the exercise. This could be contributed to the fact that the worksheet which was awarded to the supported condition already consisted of four steps in specific order. Although it was not specifically mentioned that the students were obliged to work with this order, students always adhered to this structure. Students in the unsupported condition were not awarded the worksheet, and therefore had to make a planning themselves. What stood out was that students often did not adhere to this planning throughout the exercise. This might be clarified by the fact that no suggestions for a complete shared planning were made in the unsupported condition. Mostly, the shared planning strategies were manifestations of mentioning that first information should be shared, or that, at a certain point of time, people should decide what should be included in the moon house. As no follow up steps were created, it was unclear when a certain step was finalized. As a result, students were jumping from one step to another and had a chaotic discussion. Also, in the unsupported condition it was observed more often than in the supported condition that the planning was not created at the beginning of the exercise. In these cases, the students just started with mentioning ideas for their moon house without elaborating on them. Therefore, it might be concluded that the task planning in the supported condition was of higher quality than in the unsupported condition.

When task planning did not occur or was of low quality, this led to more off-task talk which frequently entailed negative social interactions. Subsequently, students lose task focus and engaged in even more off-task talk. Research by Miller and Cohen (2001) supports this pattern, by stating that planning is a necessary prerequisite for learners to diminish interference from possible distraction. Creating a shared task planning might, thus, help students to stay focused on the task. When students were not focused on the task and possibly even engaged in negative social interactions, this asked for even more shared regulation skills along the lines of motivation strategies or correcting behavior.

Group planning

A little more than half of the groups were involved in group planning (57.7% of the groups, *M* = 2.38, SD = 5.29). As can be derived from the large standard deviation, a large difference could be observed between groups who did and did not engage in group planning. Thereby, this process is mostly co-regulated (2.81%) rather than socially shared (.78%). To clarify, typically this process involves one student coordinating the collaboration (i.e. giving tasks to other students or monitoring whose turn it is).

For group planning to occur, some conditions should be met. First, as group planning did not only occur at the beginning but also throughout the assignment, task monitoring should take place. If students monitor the task progress, they might see which students still have to explain something. In addition to that, if students monitor their task progress, students will keep in mind that when they face a new step, discussing a new group planning might be necessary. Second, students should see the added value of every student contributing to the group work in order to create shared knowledge. When collaboration is not coordinated, it could be observed that students got confused about the planning and division of labor later in the course of the assignment. This was manifested as discussions about whose turn it was, who would be next, and why. Especially in the unsupported condition, this led to a negative group atmosphere, as students would argue whose turn it was about to be. In the supported condition, this pattern did not stand out. A reason for this could be that students in the supported condition possessed the worksheet at which an order of to be discussed subjects was displayed. When group planning was not discussed in the supported condition, groups relied on the order which was displayed on the worksheet. This goes paired with task monitoring, as students kept an eye which information should still be shared and how many students still have to share information. However, this often does not entail shared task monitoring, but a lower level of regulation which involves one student monitoring who should share information next. Yet, as a result, negative interactions between group members were restricted. Furthermore, group planning is important to make sure everyone has the opportunity to share knowledge and learn from others, hence shared knowledge could be created. When collaboration is not coordinated together and task division is unclear, some students do not get the chance to share what they have learnt about their topic or to learn from others. Therefore, knowledge is rather divided among group members than shared.

Task monitoring

In total, more than half of the groups monitored the task collectively (65.4% of the groups, *M* = 3.5, SD = 4.02) What stands out specifically, is that task perceptions are shared by only 11.5% of the groups and only .16% of the codes analyzed in this study involved processes of building shared task perceptions. This pattern is also found in a study by Hadwin, Malmberg, Järvelä, Jarvenoja, & Vainiopää (2010) who indicated that students often fail to discuss their shared task perceptions and to understand the task completely. Also, the large standard deviation stands out here, which indicates a

large difference between groups. This could be identified throughout the observations as well; some groups frequently monitor their shared performance, comprehension, progress and task perceptions while other groups do not do this at all during their collaboration. Also, it stands out that some groups completely rely on monitoring of the teacher or researcher. Some groups do not spontaneously engage in task monitoring, but do so when the teacher prompts the students to think about these processes. The teacher typically does this by posing questions like "How are you keeping up with the task?", "How are you doing?" or "Which step are you performing now?". This is what also happened in the current study. When students lost task understanding, typically no discussion about shared perceptions took place in order to create shared understanding.

Also, when groups did not monitor the task, the students typically overlooked some of the steps which were necessary in order to bring the task to a good end. These effects were more negative for the unsupported condition, as they did not possess the worksheet the supported condition did have in order to check their progress. In the supported condition, the students regularly checked the worksheet in order to monitor their progress and check which steps should still be executed which reduced the likelihood of missing steps or ignoring the contribution of certain group members to the task. On top of that, when it was not recognized or responded to that certain group members did not fully understand the task or an explanation of a peer, knowledge would rather be divided rather than shared.

When the task was monitored, students kept an eye on whether their shared goal was about to be reached which requires shared understanding. Furthermore, it could be observed that groups monitor the task in order to be on the same page with their ideas and hence create shared understanding. Additionally, the observation made clear that task monitoring also involved including students in the group work when they did not share information yet. When students checked monitored the task, it occurred at times that the students realized not all information was shared yet.

Group monitoring

Only one group (3.8%) monitored their group performance, which entailed only .04% of the total amount of segments. This pattern is also found in a study by Haataja, Malmberg and Järvelä (2018), who observed that the task related behaviors are more often monitored as students believe these are more task related and therefore should be elaborated more often. As group monitoring only happened at one occasion it is difficult to determine which conditions are necessary for group monitoring to occur.

Monitoring group performance can result in communal awareness of positive and negative group patterns and will eventual lead to adaptation of these patterns (Winne, Hadwin & Perry, 2013). When a group did not monitor their group performance together, group members will not become aware of negative behavioral patterns and these might not be solved throughout the collaboration,

which resulted in more negative social interactions. When groups were engaging in off-task behavior or negative behavior, this was mostly allowed by the group members.

Task evaluation

Only one group (3.8%) engaged in task evaluation, which entailed .07% of the total amount of segments. Therefore, it can be identified that, when looking at metacognition task evaluation occurs way less often than planning and monitoring. Nevertheless, the context of this assignment might have played a role here. When the students were done with the assignment, they were instructed to call the researcher who subsequently turned off the camera and audio recording. Accordingly, it is imaginable that more groups engaged in task evaluation after the observation was terminated. Yet, as other studies mention that task evaluation not occurs quite often and is of low quality when it happens (Lee, 2014), the aforementioned statement is not encouraging.

As only one group evaluated their task outcome, it is for now impossible to identify conditions under which task evaluation occurs. But, all in all it can be identified that task evaluation is a scarce process, and does not happen out of the blue. Yet, research by Winne (2014) identifies that for task evaluation to occur, students should monitor whether the end product matches his or her standards. As setting up group standards (i.e. goal setting) was scarce in this study, it is not a surprise that task evaluation did not occur often. Students might not have evaluated the task outcome as they were in most cases not aware of the standards of their group members.

The group that evaluated the task outcome did this very superficially, namely, they discussed whether they agreed on what was written down on the worksheet (see Figure 9). They did not argue about why they agreed on something, or what could be improved. Also, they started the evaluation of the task outcome because the worksheet prompted them to do that at the final step. This makes it even more remarkable that only one of the groups engaged in task evaluation. As the evaluation was very superficial and did not entail any concrete statements about what can be improved in future collaboration, it can be suggested that evaluating the task outcome would hardly have any consequences for the performance of this group.

Cognition

The aim of using cognitive strategies is to understand one another and subsequently building shared knowledge. Overall, just a little more than half of the groups performed shared cognitive strategies (53.8% of the groups, $M = 1.85$). This low number is not a surprise, as research by Mercer, Dawes, Wegerif and Sams (2004), indicated that children need to be supported in how to use language to reason, consider information together and negotiate in order to come to collective ideas. When groups adopted shared cognitive strategies more frequently during the observation, it could be observed students listened to each other more often and asked each other more questions in order to understand

what one is saying. It seems like this has a strong motivation component, as trying to understand what others mean and taking the perspective of another student requires motivation.

Problem-solving strategies

A little less than half of the groups undertook shared problem-solving strategies (42.3% of the groups, *M* = 1.00, SD = 1.44).In order for students to come up with problem solving strategies, they should acquire adequate metacognitive (e.g. monitoring own knowledge) skills which help them to indicate how, why and under which circumstances a learning strategy should be implemented. So, it can be indicated that cognitive strategies and metacognition are connected to each other as the ability to monitor is important to identify that, and when, problems arise.

When students collectively applied problem-solving strategies to their problem, the group was able to solve the problem and create shared understanding. This was for example shown in a situation in which a group decided to draw things on a sheet of paper in order to explain their ideas for the moon house. In that case, the group collectively arranged that every group member understood what was about to be organized for the moon house.

Verifying

A little less than half of the groups engaged in collective verifying (42.3% of the groups, *M* = .88, SD = 1.66). The second observed cognitive strategy, verifying, is observed in multiple other SSRL studies (e.g. Hurme, et al., 2009). It emerged that more groups more often co-regulated verification rather than sharing it collectively (69.2% of the groups, *M*= 2.27, SD = 2.23).

Just as for problem solving strategies, motivation seemed to play a part in the occurrence or absence of verifying thoughts. To explain, students who engaged in verifying, were willing to create shared knowledge for which motivation is needed. In these situations

The consequence of verifying one's thoughts is building shared knowledge. Students, namely check together whether they understand each other's provided information.

Behavior

The aim of controlling behavior in cooperative learning was to either create or maintain a positive group climate. Overall, it stood out that regulation of behavior occurred way more often as co-regulation (92.3% of the groups, *M*=9.29) than socially shared regulation (26.9% of the groups, *M*=.5). Yet, it was considered that groups are capable of regulating behavior collectively as well.

Positive social interactions

In total, only 15.4% of the groups regulated positive social interactions (*M* = .23, SD= .59) Regarding positive social interactions, the group as a collective could ensure everybody was included in the group work. However, inclusion is mostly a co-regulated process (65.4 % of the groups, *M*

=1.58) rather than SSRL (15.4% of the groups, *M*= .23). Typically, one student included one other student who was not cooperating, ignored by group members or more aloof than the others. Subsequently, the whole group was involved in the group process again and shared knowledge could be built.

Regulation of positive behavior took place under several conditions. First, positive behavior was regulated when the group was engaging in off-task talk and told one another to participate in the groupwork again. Second, regulation of positive social interactions occurred when a student seemed to be more aloof than the others. In this situation, the student was included in the groupwork and shared knowledge could be built. For that reason, positive social interactions can be connected to group planning. Namely, inclusion might be necessary for a shared group planning to occur in cases in which not every student is participating in the group work.

Research by Rogat and Linnenbrink-Garcia (2011) mention that groups with more positive socio-emotional interactions engaged in higher quality planning, monitoring and behavioral interactions than group with more negative socio-emotional interactions. In the current study positive social interactions do not seem to be a prerequisite for shared metacognition to occur; Shared metacognition also occurs in groups who do not have much positive social interactions and even when groups have some negative social interactions. However, groups who stand out for their negative social interactions also stand out for showing little SSRL. Therefore, it might be concluded that regulating a positive group atmosphere does not seem necessary for SSRL to occur, but it does seem to be a positive influence on its occurrence. But as only inclusion was found as a regulation of positive behavior, it can be questioned what had happened if more positive behaviors were found. It can be suggested that a student might feel more motivated when he or she sees that his or her opinion or contribution is valued by the group members. Although motivation is not measured in this study, it could be observed that when students' contributions were valued by the rest of the group, they would engage with the task again.

Negative social interactions

Just as for positive social interactions, 15.4% regulated negative social interactions (*M* =.27, SD = .67) Also, regulation of negative social interactions occurred more often as co-regulation (92.3 % of the groups, *M* = 8.34) than as socially shared (15.4% of the groups, *M* = .27).

Negative social interactions occurred under several circumstances. Mostly, they occurred when group members were involved in off-task talk or off-task behavior. Additionally, they emerged when the group did not make a clear group and or task planning. In this particular situation, disrespect was manifested as arguments about who was allowed to tell something and what should happen at a specific point of time. The negative social interactions were regulated in situations in which the group was willing to continue with the task. This could be concluded from the fact that regulation of negative behavior always had the intention to stop the student from acting off-task or any other negative way

and engage with the task again. Yet, negative social interactions were not always regulated as this off-task talk or behavior was mostly allowed by the group.

Interestingly, groups who stood out by their negative social interactions hardly engaged in SSRL. This might be clarified by research by Rogat and Linnenbrink-Garcia (2011) who stated that groups with more positive socio-emotional interaction engage in higher quality planning, monitoring and behavioral interactions than groups with more negative socio-emotional interactions. Therefore, groups who engage in more negative interactions, might engage in lower quality planning, monitoring and behavioral interactions (i.e. less SSRL), than groups with more positive social interactions. However, when negative social interactions were regulated by the group, the group was able to continue with the task. Nevertheless, regulating negative social interactions was not always effective over time as could be observed that groups frequently kept on performing off-task talk or negative social interactions throughout the course of the task. Besides, when negative social interactions were not regulated, negative social interactions and off-task talk were persisted.

Motivation

The aim of using motivation strategies in cooperative learning was to maintain or foster motivation of the group. Overall, less than half of the groups engaged in collective motivation strategies (30.8% of the groups, M = .5, SD = .86)

Task motivation

About a third of the groups regulated their task motivation collectively (30.8% of the groups, M =.50, SD = .86). Just as for behavior, it appeared that students mostly co-regulated their motivation (80.8% of the groups, M = .3.88) rather than collectively regulating it (30.8% of the groups, M = .5). In most cases, one student motivated one of the other students when he or she was engaging in off-task talk.

According to Schwartz (1995), motivation is the engine for creating shared understanding within the group. Group members should put effort into understanding other group members, for which intrinsic motivation is required. Thus, motivation is a prerequisite for SSRL to emerge (Järvelä & Järvenoja, 2011). Unfortunately, this study did not measure motivation by a questionnaire like the study by Järvelä and Järvenoja (2011) did, so therefore this claim can not be made for the current study. Besides, relating the frequency of shared motivational strategies to the frequencies of other areas does not give much information as this does not indicate how motivated groups in fact are.

Though motivation and motivation regulation are conceptually different, in the current study it appeared that when the group applied motivation strategies to motivate each other, the group member who initiated a motivational strategy was willing to create shared knowledge. This was manifested by mentioning that he or she believed it was important to stay focused and to share ideas with each other. This happened for example during situations in which stimulating task focus was applied. Stimulating task focus always occurred when the group disengaged with the task due to diminishing motivation or

interest for the task. Additionally, Praising others is important in order to create a positive group atmosphere (Kreijns, 2004). Subsequently, students feel more motivated to complete the task (Jehn & Shah, 1997). Also, regulation of positive social interactions is important.

Theoretical model

In Figure 17, the theoretical model of how SSRL is manifested in cooperative learning could be observed. In grounded theory research, a model portrays a collection of concepts and their relationships integrated in a cohesive model (Sbaraini, Carter, Evans, & Blinkhorn, 2011). First, in this theoretical model it could be observed that SSRL consist of 4 categories, being metacognition, cognition, behavior and motivation. Subsequently, the subcategories linked to these categories are identified with bold lines between the categories and subcategories. Finally, links between subcategories were created by making use of the prerequisites and consequences of each of the subprocesses of SSRL. Continuous arrows were used to identify links that were observed in the current study. Intermittent arrows were used to identify links that were not observed in the current study, but were observed in literature. This only refers to the link between task monitoring and task evaluation.

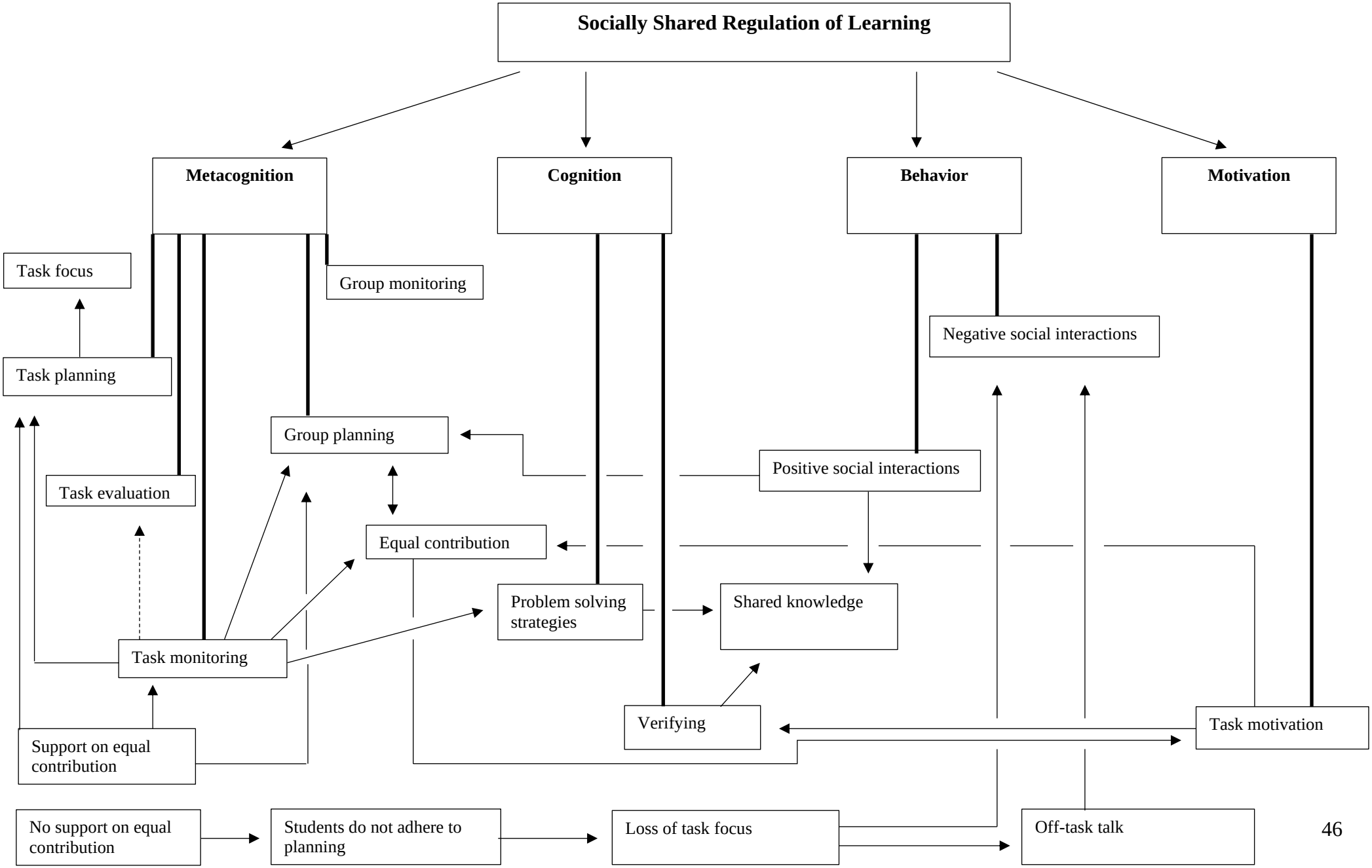

Figure 17. Theoretical model of SSRL

Discussion

The aim of the current study was to investigate how SSRL is manifested in cooperative learning. Also, the effect of equal participation was investigated by means of observing the SSRL processes in two conditions. The supported condition was supported with a worksheet which fostered equal participation (van Dijk et al., 2019). The unsupported condition did not have access to the worksheet.

First, SSRL was identified by means of observations. According to literature SSRL involves collectively sharing metacognitive, cognitive, behavioral and motivational strategies in order to achieve a shared group goal (Hadwin et al., 2011; Hadwin et al. 2017). The current study supported the fact that students are able to collectively set up strategies to regulate metacognition, cognition, behavior and motivation of the group as a whole. Also, this study created sub-categories within these categories. By means of information gathered of the observations, this study created a theoretical model of the manifestation of SSRL. Whilst this study aimed to investigate SSRL as a whole, it especially underlines the importance of the regulation of social activities, as many studies only focused on the task-related aspects of regulation (van der Meijden & Veenman, 2005). The current study, namely, points out that regulation of social aspects are both products and prerequisites of SSRL skills. This is in line with research by Hadwin et al. (2017).

Additionally, frequencies of the occurrence of SSRL were computed. First, it stood out that SSRL hardly ever occurred in the context of this study. In total, only 5.69% of the codes could be attributed to SSRL. Second, only three subcategories were observed to be performed by a little more than half of the groups. All other subcategories were observed in less than half of the groups. This is in line with research by Järvelä et al. (2014), who claimed that students often fail to regulate their learning process. Apart from SSRL being a scarce process, some subprocesses involved considerable between group differences regarding the quantity of occurrence. Until now, it remains unclear what causes the difference between the occurrence of SSRL between groups and more specifically, which individual differences might cause these differences (Panadero & Järvelä, 2015). Yet, it could be questioned whether the lack of occurrence of all these skills was detrimental for the students' learning processes. For some skills, it could be observed that when they were lacking, students fell into unproductive patterns of cooperative learning. When students did not create a shared planning or division of labor, this led to confusion among the students which led to off-task talk and sometimes even negative social interactions. When negative social interactions were not regulated, this pattern of negative social interactions persisted. So, these skills could be considered effective for a productive cooperative learning process as not engaging in these shared processes will lead to less time spent on the task. However, it is unknown whether this would also negatively affect their learning performance.

Also, for some SSRL skills it can be questioned whether it is important for them to be socially shared instead of co-regulated. For example, it could be observed that especially the codes that

belonged to the categories behavior and motivation were most often co-regulated rather than socially shared. Within these categories, behaviors that were socially shared were even scarce. Also, some situations in which students collectively shared motivation strategies seemed quite artificial, as could be observed in Figure 16. Therefore, it can be questioned whether collectively regulating behavior or motivation is a natural process for students to engage in and whether it has an additional value over co-regulation. For example, one student correcting the behavior of one other student (i.e. the student co-regulates the other student) so the whole group could work together to achieve the shared goal might provoke the same outcome as multiple students correcting one another's behavior (i.e. SSRL). Therefore, the fact that behavior and motivation were mostly not socially shared did not seem to be a problem in the current study.

However, it should be mentioned that the importance of some skills was not easily determined. As task evaluation is a process that takes place after the execution of the task so the exact effects of task evaluation could not be observed. However, as the student's performance was not investigated, it cannot be concluded whether the lack of some SSRL skills have negative effects on the task outcome.

The second aim of this study was to investigate whether groups who received collaborative support to increase equal participation would show more SSRL than groups who did not receive this support. This research demonstrates that no significant differences could be found regarding the frequency of occurrence of the SSRL subprocesses between the supported and unsupported condition. This seems to be in contrast to what was suggested by Volet et al. (2009b), who claimed that equal participation in groups leads to higher level regulation (i.e. SSRL). Also, this contradicts the assumption that the collaborative support might increase group awareness and subsequently diminish unproductive off-task talk which decreases students' cognitive load (Kirschner et al., 2018). Yet the fact that the support did not cause significant differences between the unsupported and unsupported group can be clarified by the fact that the support that was mainly focused on equally sharing task related content (van Dijk et al., 2019). Subsequently, students were primarily occupied with sharing information rather than sharing regulation strategies. On top of that, the fact that students in the supported condition received a worksheet might have taken away the freedom to engage in SSRL as the worksheet slightly structures the assignment already. For example, the worksheet already presented an order of the topics that were about to be discussed. Whilst it was not mentioned students were about to work in this order, groups in the supported condition mostly relied on working in that order, sometimes without discussing it. The planning of the task and collaboration was therefore more often monitored by one student who kept an eye on the worksheet. Additionally, the worksheet also presented some steps which should be performed in specific order and hints were given about important points to discuss at a certain point. This might also have taken away to regulate a task or group planning or learning strategies collectively. With this line of reasoning, one could expect that these SSRL skills would have even occurred less often in the supported condition in comparison to the unsupported condition. However, as can be observed in Table 5.1. and 5.2. this is not the case.

Therefore, it might be the case that equal participation might, at some points, have fostered higher levels of regulation (i.e. SSRL) but that this effect was cancelled out by the presence of the worksheet.

Implications

The outcomes of this study provide mainly theoretical implications rather than practical implications. This study presented a focused coding scheme (Table 2) which might benefit researchers in the field of SSRL when they wish to observe SSRL themselves. Furthermore, this study substantiates the existence of several SSRL processes which were not paid attention to (sufficiently) yet in previous research. The theoretical model displays a new basis of how SSRL is manifested in cooperative learning. More specifically the current study gives an overview of SSRL skills which are hardly ever shown by students, but were considered as necessary for an effective cooperative learning process.

Limitations and future research

The first limitation of this research was that some subcategories were difficult to substantiate and link to the other subcategories as they seemed to occur infrequently. This can be confirmed by research of Volet, et al. (2009a) who mention that it is difficult to distinguish between collaboration, knowledge co-construction and social regulation. Research by Malmberg, Haataja, Seppänen and Järvelä (2019) add that some SSRL processes are difficult to measure by the unaided eye. They describe an example of a group of three students in which two of the students verbally expressed they were monitoring the task whilst the third student did not verbally express he is monitoring. Does that mean this student was not monitoring the task? As SSRL is a result of individual self-regulation, it is difficult to determine whether the whole group of three students is mentally synchronized. Therefore, Malmberg et al. (2019) measured students' physiological synchrony by means of measuring electrodermal activity with wristbands during the collaborative process. Hence, it could be determined whether monitored the task jointly. Physiological measurement instruments might therefore be something to consider in future research about SSRL.

It might be the case that certain SSRL behaviors are just scarce and are not naturally portrayed by student when they are not instructed to do so. However, it might also involve that only one specific context of cooperative learning (i.e. the jigsaw method) was investigated (Aronson et al. 1978). As the jigsaw method has a quite specific division of labor and group composition, it might be the case that SSRL plays a smaller role than in other forms of learning where students have to create their own roles. To get a better picture of the manifestation of SSRL, research should also investigate different cooperative learning contexts.

Additionally, it stood out in particular that students hardly engaged in collective regulation of motivation and behavior. This might be clarified by the fact that the element *appropriate use of social skills* of the Social Interdependence Theory by Johnson et al. (2007) was not incorporated in the collaborative support and therefore is one of the limitations. Young children often experience

difficulties in performing adequate social skills (e.g. decision making, conflict managing) in cooperative learning, which could also refer to regulating social situations in cooperative learning. Performing adequate social skills in cooperative learning requires extensive training (Gijlers, Weinberger, van Dijk, Bollen, & van Joolingen, 2013). The fact that the worksheet mostly prompted task-related behavior (van Dijk et al., 2019) can also clarify why students were mainly occupied with task-related related regulation rather than regulation of social aspects. Future research might investigate how these social skills can be taught in order to be effective for SSRL. Another limitation regarding the collaborative support on equal participation is that the worksheet might have cancelled out some of the effects of equal participation on SSRL.To test whether this is true, future research should investigate how to foster equal participation without giving the students a framework which takes away the opportunity to engage in SSRL.

Furthermore, this study observed large differences between the frequency of occurrence of SSRL between groups. This study was not able to identify why these differences occurred. However, during the observations it stood out that some students came up with SSRL strategies, but they were not responded to by their groupmembers. Research by Rogat and Linnenbrink-Garcia (2011) observed the same phenomenon. Therefore, it might be useful to investigate whether, and if so, which, individual differences play a hole here. This is supported by Panadero and Järvelä (2015), who mention that it is not only important to look at the group process but also at the individual differences students bring to the group. Subsequently, one can better understand what is necessary for effective SSRL to occur.

To conclude, the fact that SSRL seemed not to occur frequently is not a surprise. Regulation is a skill which students cannot learn by themselves, but should be taught and modelled by a teacher (Taks, 2003). Yet, teachers often fail to teach their students strategies for self-regulation (Moos & Ringdal, 2012). This, together with the fact that large differences exist between the extent to which groups engage in SSRL, research should focus on creating adaptive support for students to support SSRL. A way to do this might be focusing on creating transactive memory systems, which is a concept invented by Wegner (1987) and often used in organizational psychology. Transactive memory means that group members can use one another as external memory aid and consult each other's expertise. For this to be effective, group members should be aware of the knowledge of the group members. For example, student A might be an expert in keeping an eye on the group atmosphere, while student B has knowledge about cognitive strategies which could be applied during the cooperative process. This also fits with the thesis of cooperative learning, which indicates that students need each other's expertise in order to obtain the group goal (Johnson et al., 2007). What is more, having a transactive memory system will also reduce cognitive load, as labor is divided among group members (Mohamed & Dumville, 2001) However, research about transactive memory systems is mostly about the division of expertise in content-related knowledge, so transactive memory is possibly not generalizable to self-

regulation. Yet, future research should indicate whether these theories about team learning in organizations might be applicable for SSRL.

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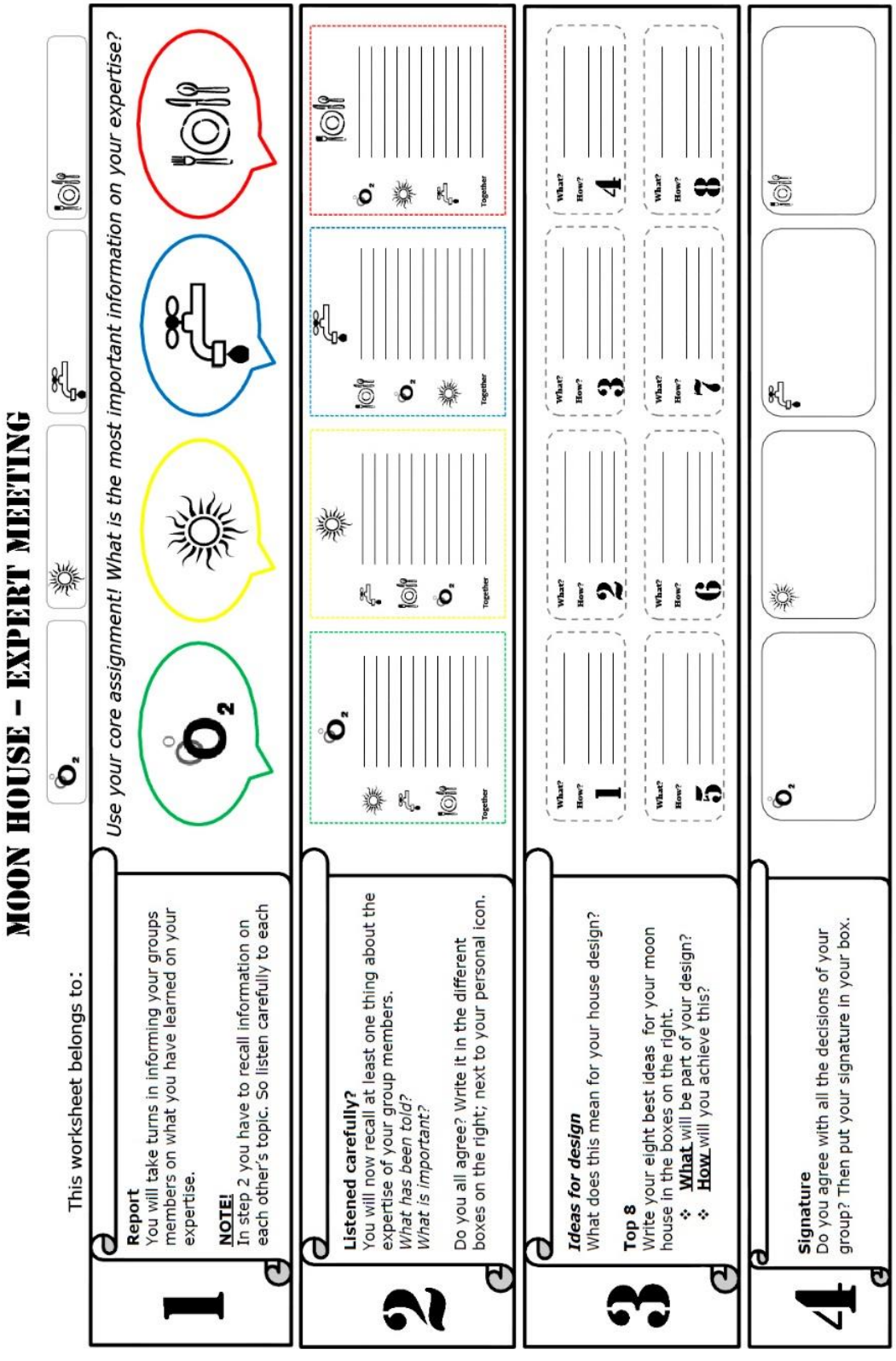
Appendix A

Worksheet supporting the cooperative dialogue



Appendix B

Memo writing

Group 1

At the beginning of the cooperative process, student 1 suggests a planning strategy. She suggest that before the group starts, each group member should write down his or her name. Group members agree with this, and each group member writes down his or her name on the worksheet. While doing this, the group is collectively coordinating the collaboration, as they pass on the worksheet to the next student so that all names can be written down. Student 1 also monitors what student 4 is doing, and corrects him when he writes his name in the wrong box. Student 1 also monitors student 3, and tells him where he has to write his name down. In the meantime, the group engages in a lot of off-task talk. Student 1 additionally monitors the task progress of student 3, as he takes writing down things on the worksheet takes a long time. Afterwards, she mentions what the goal of the assignment is and suggests to discuss the order of telling about one's subject. No one is willing to start, so she decides to start telling about her topic. Student 4 sarcastically mentions "Oh, you are soooo wise.". While student 1 is explaining her topic, the other students are quite distracted by the camera, microphones and their group members. When the students are explaining what they have learned, hardly no SSRL takes place. In this stage, the students are just explaining what they have learned. Throughout this phase, student 1 monitors whose turn it is and mentions what each student has to do. For example, she mentions "It is your turn, you have to read aloud the questions on your paper." When student 3 is distracted while it is his turn, student 1 stimulated student 3 to continue with the task. She does that by mentioning "Shouldn't you continue?". Student 3 also corrects the behavior of student 4 when he is misbehaving. Student 4, namely, was playing with the microphone on the table. Student 1 does this as well, when she noticed the group kept on playing with the microphone. Throughout the exercise, student 1 keeps on monitoring that everybody writes something down, whose turn it is, and makes sure everybody understands the exercise. Also when students do not work as fast as she wants or are distracted, she stimulates the group members to continue with the task. Furthermore, she suggests to discuss together how they are going to arrange light in the moon house. Student 2 also starts to monitor the collective work when student 3 says that they might need oxygen in the moon house "No, we already wrote that down." During the end of the exercise, the group is discussing together what they need in their moon house. They are creating shared knowledge. However, not a lot of regulation strategies are shown here. Mostly, they just mention some things and one of the students writes them down. These are mostly exchanges between 2 students. At the end, student 1, who has the worksheet in front of her, mentions they are finished with the assignment and says that everyone has to sign the paper. The students do not evaluate the outcome.

All in all, the group was mostly regulated by student 1. Co-regulation seemed to occur more often than SSRL.

Group 2

In this group, no shared planning was made. Student 2 mentions "I want to start!" and student 1 says "Okay, you start." Student 3 explains to student 2 what he has to do. Also, he monitors which question student 2 has to read aloud. When student 2 is done with giving information about his topic, student 3 says "Now it is my turn!" and he starts sharing information about this topic. Student 2 monitors his performance, as he is mentioning that he is giving the wrong answer. Student 1 and 4 are showing disrespect towards student 3 as they are laughing together when he is providing information and student 4 is hitting student 3 on his head. When it is the turn of student 4, student 3 also monitors her performance by mentioning that she is not doing it correctly. He is doing this by showing disrespect: He is hitting her paper and shouting at her. Student 2 also monitors the performance of student 4 by mentioning that she is not providing the correct information. Student 1 monitors the comprehension of the group members by asking them questions about her topic. Student 4 monitors the performance of student 1, by saying that she has to write down a better answer on the worksheet. Throughout the exercise, student sometimes fight about whose turn it is to give an answer. Maybe this is because they did not discuss a shared planning of cooperation. This leads to unclarity in the group, and discussions about who is first. Also, group members are yelling their answers one after another without carefully listening to each other. Student 1 corrects the behavior of student 3 when he keeps on playing with the

microphone. Student 1 and 3 monitor the task progress together, as student 3 wonders which step they are performing. In the middle of the exercise, student 3 suggest a cooperative strategy: The student whose name is written down first at the worksheet can start telling something and so on. Disrespect seemed to occur also, but always between two students. For example, student 3 asked whether his group members knew how dinosaurs were deserted. Student 4 said that she did not care about that. The cooperation was also regulated by just giving the materials to another student. For example, student 4 decided it was the turn of student 2 to write something down. She gave him the worksheet and a pencil. The group also adopted a learning strategy in order to select answers which could be written down on the worksheet. They wrote down more answers than necessary, and decided to vote which answers were the best options. Throughout the exercise, student 3 kept an eye on the time. This can be seen as task planning. The other group members became aware that they still had half an hour to discuss their answers. Together, they decided that they could easily make it in time. The group continued choosing the best answers. They did this together as a group, but at times just student 1 decided which answer was the best.
For both group 1 and 2, it stood out that a lot of behavior was off-task or did not relate to regulation of any kind. In the first video, the regulatory behaviors that stood out mostly dealt with metacognitive regulation. Therefore, codes as Task Planning, Task Coordination and Monitoring progression could be developed. In the second video, the social aspect of SSRL stood out more. In this video, a distinction could be made between positive and negative social interactions. Both codes can have an effect on the motivation of group members. For both video's, it stood out that evaluation of work did not occur at the end of the task. Also setting up shared goals did not occur often. Also, it looked like as if most regulatory behaviors were co-regulated instead of socially shared.

Group 3
From the three video's that have been analyzed by now, there seems to be a relationship between ability level and SSRL. Most often, the high-ability student is the one who brings the group back on track when they have off-topic talk, when a new topic should be addressed, or when another student has to add information. From this point on, I wonder whether this has to do with one's intelligence or with other personality traits high-ability children have. On top of that, in the third video it became clear that Consensus Building is an important social aspect of SSRL. Consensus Building, namely, leads to a shared vision. Also in this video, mostly co-regulation rather than SSRL takes place. Mostly one group member asks another group member to perform a certain task, or one group member corrects the behavior of one other group member. When this happens, it seems like as if part of the group keeps their focus on the task while others do not focus on the task.

Group 4
From the fourth video, it became clear that verifying ideas might also be an aspect of SSRL. On top of that, it could be observed that possible not all group regulation strategies are observable. For example, one girl in the video seemed to analyze information on the worksheet, but did not verbally address this. Also, monitoring correctness might not always be observable. Therefore, one cannot be sure whether she in fact did analyze the information.
Furthermore, a distinction was made between planning of the task and the planning of collaboration. For the task planning, students discuss what needs to happen in which specific order. For planning of collaboration, students discuss who is assigned to a specific task.
What also stood out in all the analyzed video's is that SSRL often seems to be manifested by the researcher/ teacher in the room. When she recognized the group is running out of time, when more elaboration is needed on a statement, or when they have to continue working on the task, this is often notified by her and she regulates the children.

Group 5
In this video, it stood out that one student was often making cognitive judgments about what others were telling. In this way, she is able to filter out what is important information and what is not important information.
Also, identifying which part of the assignment is to be completed might be considered as monitoring planning.

Group 6

Video 6 was the first video which was coded in de focused coding phase. At the beginning of this video and after reading more literature about SSRL, it became clear that SSRL is not about co-constructing knowledge. Therefore, the code 'consensus building' was excluded from the coding scheme. However, students can use strategies to build shared knowledge, for example asking for clarification and verifying.
Also, a new code was added to the coding scheme. This code involves evaluation of the collaborative process.

Group 7

Student one immediately included the whole group in the assignment, by mentioning "What do all of you find important?". Student 2 decides that the person whose specialization is written down on the worksheet first has to start telling about her topic. Therefore, student 1 starts providing information about Light and Heath. When student 2 wants to write down some things about what she heard from student 1 on the worksheet, student 1 corrects this by saying: "No, first the others have to tell something", which can be seen as both inclusion but also as task planning. Student 1 monitors when a student is done with talking about her topic and gives the turn to the next student. When student 4 is talking about her topic, the group members think that she speaks too soft. Resultingly student 2 and 3 pick up the microphone and put it on the table of student 4. Student 1 sees the microphone is still not close enough to student 4. She picks up the microphone so that student 4 can speak in it. This can also be seen as a form of inclusion, as student 4 now might see that her contribution is valuable to the group. Later in the group process, student 2 also helps monitoring whose turn it is. Also, she mentions that the next step is that everyone should write something down for each topic. Next to that, she includes student 4 again. Student 4 seems a little bit more aloof than the other group members, which might be why the others want to include her in the group work more. Afterwards, student 1 again monitors whose turn it is to speak.
For this group, it stands out that they perform a lot of on-task behavior and listen well to each other. Also hardly any negative behavior is shown. Once, student 2 and 3 were laughing together when student 4 was telling something. Student 1 corrected the behavior of these 2 students, and mentioned that they should listen to student 4. This attempt worked and student 4 could speak while everyone was listening.
Student 1 also monitors the task progress, as she mentions that each group member already mentioned the most important things. Student 2 also frequently verified what others were saying. Verifying typically occurred between two students. Student 1 also sometimes verified whether the others understood what she was saying. When student 3 was talking to a member of another group, student 1 stimulated their task focus by saying that student 3 had to participate in the groupwork again.

Group 8

At the beginning, no planning was made. Student 3 told student 4 that he had to start. A plan for cooperation, tbus, was not collectively created. During the course of coding this video, some clusters could be suggested. One cluster for example, could be regulating content understanding. This involves the strategies students use in order to create shared knowledge. What also stands out, is that it seems like as when groups perform little SSRL or co-regulation, the groups hardly listen to each other and just mention every idea that comes to their mind without group members really responding to it. Group members do not ask for more elaboration, verification or clarification.
When the worksheet was not clear, the students discussed together who would fill in what and how. To do this, the goal of the assignment was discussed. Student 3 continues with coordinating whose turn it is. At a given point, student 4 believed it was his turn. The group discussed together that it was not his turn, as they were working with the order provided on the worksheet. Students also verify one on one whether their answers were correct or good enough to put on the worksheet.
Student 3 also monitors the answers of other students, for example she mentioned that student 1 wrote down 'airco' a lot as a tool for the moon house. She believed that they could also use solar energy

instead of an airco all the time. She also controls the behavior of student 2, who was talking too fast in her opinion.
When the students continued with step 3, they did make a order for cooperation.

Group 9
The group did not plan cooperation and did not make a planning. Student 2 just started talking. Student 1 decides that he is next "Now it is my turn." When student 3 wanted to talk about her subject, student 1 recognized that student 2 was not listening. He said "You have to listen to her!" So, student 1 stimulated the task focus of student 2. When student 1 believed the students talked enough, he said that they had to go to step 2. So, he was making a planning for the whole group. All group members listened to him and looked at the worksheet again. He also monitored the progress of the group, as he believed everyone was done talking. When step 2 started, student 2 again decided that he could start with the assignment. He does not start, instead, they engaged in a lot of off-task talk which was related to the camera and the microphone. Also, he was distracted by other groups in the room. Before step 2 started, student 4 asked the group members what the step 'together' entailed. Thus, the group was not working on a structured planning. Yet, student 4 was verifying the meaning of the step 'together' and the group created shared understanding as they figured out together what the step entailed.
Furthermore, the task perceptions were not shared in the group, as some students mentioned they liked the exercise and some mentioned they did not. When student 2 mentioned he did not like the fact that his group had to work with the worksheet while some other groups were allowed to draw. Student 4 and student 1 were trying to keep him included on the task. Student 1 mentioned "Well, maybe you can draw another time.". Student 4 said: "They also had to talk like we did.". Maybe this positively influenced the motivation of student 2. Remarkably, he immediately participated with the assignment by filling in the worksheet. During the group process, sometimes discussions occurred between group members about whose turn it was, e.g. "No, it is my turn!". What stood out as well, is that they did not discuss the goal and the planning. Resultingly students filled in the worksheet individually, mostly without discussing the answers with the rest of the group. This resulted in off-task talk by other group members. Especially student 1 and student 2 were easily distracted and teasing each other. They were saying negative things about each other. Behavior was controlled by student 4 at times.
During step 2, they verified the answers when the researcher mentioned that they had to discuss the answers together instead of individually writing answers down. However, the group did not agree on what could be written down. Student 2 believed the answer "When it is hot, it is not cold" was good enough. Student 1 did not agree. Student 3 asked all group members whether they believed the answer was good enough to be written down on the worksheet or not
At a given point, student 3 and 4 were not paying attention to the task anymore. Student 1 and 2 stimulated their task focus by saying that they had to pay attention.

Group 10
The started with discussing the goal of the exercise together. Then, student 4 mentions that student 2 has to start with telling about what he had learned about his topic. When student 2 did this, he asked his group members if they had any questions. So, he monitored their comprehension. Student 4 keeps track of which student is next to tell about his or her topic.
When everybody is done with explaining their topic, student 2 verifies whether the other students understand what he explained. He asked his group members to explain the water cycle. When the group arrives at the second step of the worksheet, student 2 explained the goal of that step and in which order they had to work. Student 2 also wanted to share his task perceptions with student 4, but student 4 said they had to be quiet because student 1 was thinking about things to write down on the worksheet.
Throughout the second step, student 2 keeps on monitoring whose turn it is and what the goal of the step is. Also, the whole group as a collective was discussing about the goal of the step 'together'. Student 4 also incidentally monitored the progress of individual group members.
When student 2 was distracted from the group work, all other students stimulated his task focus by calling his name. Individually seen, student 2 showed a lot of motivation for the task. For example, he mentioned that he could not wait to work on his part of the task and he really wanted to write things down.

When the group was working on the step ‘together’ he suggested a learning strategy: He said that for the part together, the owner of each topic could write down what is important for that topic to include in the moon house. He asked whether the group was okay with it.
Task focus was stimulated one on one multiple times. For example, student 1 said that student 4 had to participate again as he was not cooperating anymore. Also he suggest a learning strategy for cooperation.
At the end of the cooperation, student 1 includes her other group members as she wants them to think with her as well.

Group 11
Student 4 was willing to make a planning in order to decide who could start the assignment. Student 3 interrupted her, and said that first, they had to write down their names on the worksheet. Student 3, therefore, was monitoring the task progress. Student 1 decides he can go first, as his symbol is displayed on the worksheet first in the row. They decide to take the sequence of the symbols as the planning they will adhere to. Student 1 monitors who is next. The task performance was also monitored together, namely, they monitor the quality of the provided answers by the group members. Student 1 showed disrespect towards student 4, as she was stuttering. Student 2 included student 4 in the group work, by saying “Let her speak”. Student 3 monitors the task progress of student 4, as he realizes she did not fill in everything on her personal worksheet. Later, student 1 was acting nice towards student 4 when she was struggling with giving the answer. Student 4 said “It is okay if you do not know the answer.”. Maybe, as student 2 stimulated student 1 to include student 4, he might have realized that it is important to remain nice to student 4 and that she can think about her answers and is allowed to make mistakes. At the same time, the group used an inclusion strategy for all members to listen to student 4 and corrected each other’s behavior as they were not listening to student 4.
After student 4 explained her answers, she mentioned that she did not check her answers the day before. The whole group together monitored the performance of the provided answers, as they believed together that it was important to check the answers before giving them.
When the student were interrupted by the teacher, they decided it was necessary to focus on the task again. They stimulated each other’s task focus by yelling “order, order!” Furthermore it stands out that correcting behavior and regulation of negative interactions mostly occurred between 2 students, and not within the whole group (co-regulation). For example, one student tells another student that he or she has to be quiet of should stop touching the microphone.

Group 12
This group also based their collaborative planning on the order in which their symbols were written down on the worksheet. Student 3 monitors the task progress. Also, the behavior is corrected mostly between two students at a time. The groups were mostly busy with sharing information. They did not engage in SSRL that often.

Group 13
1 student corrects the behavior of the group by saying “ Okay, act seriously now”. This was effective, as the group continued working on the task. Such a situation occurred more often and mostly the group continued to work on the task again. Strategies to regulate behavior and motivation were mostly co-regulated. By means of the worksheet, the order of cooperation was monitored. This was manifested as students asking whose turn it is by looking at the symbols on the sheet. Student 4 seems to loose her motivation as she is distracted by the noise in the room. The group does not do anything to increase her motivation. Student 4 continues to engage in off-task talk occasionally. At a certain time, the whole group engages in off-task behavior.

Group 14
This group is the last group which was analysed for the experimental condition. All in all, it stood out that it seemed like that the person who initiated SSRL was often a high-ability student. This might be because they might be more motivated, and therefore attach more value towards completing the task in a good way. Also, it might just be that they might have more knowledge about strategies they can use in cooperative learning. Another thing might be that high-ability students might have more self-esteem

in in academic life, which makes them more confident about discussing strategies. Furthermore it looks like as if some theoretical links between concepts can be constructed. It seems like when student loose motivation, other students motivate them to stay engaged with the task. Also, it might be that less SSRL can be related to more off-task talk.
Overall, it stands out that planning mostly relates to planning the collaboration. This often involves dividing who will start talking about their subject.

Group 15
Before the group started, no planning was made and collaboration was not coordinated. Student 1 just started with mentioning important things for the moon house. This leads to lack of structure in the conversation. This is typified by a lot of off-task talk and skipping from one subject to another. This makes it difficult for children to pay attention to what is going on. A lot of essential information might have got lost within this conversation. It also stands out that they talk about different topics at the same time.
Additionally, as the students did not plan the collaboration some discussions occurred regarding who should speak at a certain point of time. This leads to some negative social interactions.
Regarding SSRL: The goal of the assignment was mentioned. Also almost at the end of the exercise, the collaboration was planned. The group discussed together who had to draw the moon house.
Also, after the teacher interrupted the class, one of the students mentioned that he believed they were discussing very well. The other students agreed with that.

Group 16
At the beginning, the group discussed the goal of the exercise, which was to create a moon house. Also, a learning plan was created before the group started the exercise and they made a plan for collaboration.
One student also often asked the other students to think about their task perceptions. At a given point, it became clear that the students shared their task perception: they all liked the task. Therefore, it can be assumed that there can be both positive and negative shared task perceptions, which might influence SSRL
At a given point, the students do not know what they have to do. This leads in a lot of off-task behavior.

Group 17
It stood out that SSRL occurred only once. Also co-regelation did not seem to occur often. In this group, the students just mentioned a lot of ideas and did not really seem to listen to each other and did not ask for clarification or more information when a group member mentioned an idea for the moon house. What stood out, is that the goal of the assignment was mentioned multiple times in this group, whilst the goal was not mentioned often in the experimental condition. It might be the case that talking about the group goal was a learning strategy for the group to stay more focused on the task.
Furthermore, a lot of off task talk occurred in this group. Also, no planning, monitoring and evaluation took place in the task. The collaboration was only coordinated once in the beginning.

Group 18
This group engaged in a lot of negative social interactions like disrespect. Furthermore, they engaged in a lot of off-task behavior. Also they were mostly working on themselves in the beginning and almost only talked off-task.

Group 19
In this group, it also stood out that the group did not apply any learning strategies and did not plan the collaboration.

Group 20
In the current group, the collaboration was not planned. Also, no learning strategies were discussed and the task was also not planned. This lead to a very unstructured discussion, in which children started to mention their ideas without elaborating on them or listening carefully. As there was no

clarity about the planning of the collaboration, group members had discussions about who should talk. This lead to negative social interactions.
At a given point, a group member asked what they had to do at a given point of time. They did not create a shared planning, but instead the group member asked the high-ability student specifically what they had to do. In this group, the high-ability student was mostly the one who was regulating the behavior of others. For example, she often told the others whose turn it was to talk, that other group members had to listen to each other, and what the next step was.

Group 21
This group started with stating the shared goal.
One child wanted to engage in the exercise while others were engaging in off-task talk. She started to stimulate task focus. Also inclusion occurred quite often, as the student was often asking other students for ideas.

Group 22
In this group, it stood out that one student attempted to coordinate collaboration by saying that it might be a good idea that they would talk one after another clockwise. The high-ability student disagrees and gives another student a turn. In the beginning, it clearly stood out that the high-ability student engages in a lot of co-regulation. For example, she decides who has to talk and provides other students with learning strategies.
A few minutes later in the collaboration, a similar situation occurred. A student suggested a collaborative strategy, but the high-ability student disagrees and gives another student a turn. Maybe, high-ability students are seen as students with more authority, which makes other students listen to them.
Also, this is the first time the code 'Praising Persons or Ideas' was observed in Socially Shared context. The group created a strategy to praise the group members to clap for each other's contribution.

Group 23
This group started asking question about each other's topics. They did not coordinate the collaboration or plan the task.
The group did engage SSRL inclusion. One student mentioned that all topics were important. Other students agreed with that. Also the high-ability student suggested a learning strategy, which was to write down things for their moon house. Group members agreed on doing this.
At a given point, the high-ability student gives tasks to group members and decides the learning strategy.

Group 24
This group did not plan the task and also did not coordinate the collaboration. Also here a discussion occurred about the order of collaboration.

Group 25
This group started the cooperation without making a planning. Student 4 started with talking about her subject, but according to student 3 she wasn't doing it right. This lead to an argument between the two students. Student 3 said that student 4 was incapable and student 4 told student 3 to shut up. Maybe, the lack of SSRL leads to negative interactions within the group as there is no clarity/ consensus on what to do and how to do it.
Also in this group it could be observed that the high-ability child divides the tasks among group members. Also, the high-ability students seems to correct the behavior of others quite often.
In this group, a lot of off-task behavior occurred. This lead to controlling behavior often. This manifested in statements like "Act normally!" or "You should cooperate seriously." Also this group wasn't really finished when they said they were finished.