Student- and Task-Related Predictors of Primary-School Students' Perceptions of Cooperative Learning Activities

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Abstract

To be able to effectuate the success of cooperative learning, it is important to understand students' perceptions of specific cooperative learning activities. However, students' perceptions of one and the same cooperative learning activity can vary to a large extent. To gain insight into student- and task-related sources of variability in students' perceptions of a cooperative learning activity we examined if cognitive and social perspective-taking ability, instructional mode, and individual and group level-learning outcomes can predict primary-school students' perceptions of relatively easy and more complex cooperative learning activities. The newly developed PCLA-Q was used to measure students' perceptions of cooperative learning. Multilevel analyses revealed that social perspective-taking ability explains students' perceptions of engagement in cooperative behaviors, but only when working on an easy task. Cognitive perspective-taking ability accounts for variability in students' attitudes towards and perceived utility value of a complex task. Group learning outcomes, but not individual learning outcomes, can positively predict students' attitudes towards and perceived utility value of both easy and complex tasks. Group learning outcomes also predict perceptions of engagement in cooperative behaviors while working on easy and complex tasks. We found no evidence that differences in the instructional mode affect students' perceptions of a cooperative learning task. Hence, our findings suggest that students' perceptions of a cooperative learning activity can vary between students and as a function of contextual variables, depending on students' perspective-taking abilities, group learning outcomes, and the complexity of the task.

Keywords: student perceptions of cooperative learning; perspective-taking ability; instructional mode; learning outcomes; task complexity.

1. Introduction

Over the past decades, research has consistently shown that cooperative learning can be an effective educational method to augment students' (meta-)cognitive, affective, and motivational learning outcomes (see Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003, for a meta-analysis; Johnson & Johnson, 2009; Roseth, Johnson, & Johnson, 2008). An activity in which two or more students take part is truly cooperative if the task promotes positive interdependence: Students need each other to solve the task at hand (e.g., Ortiz, Johnson, & Johnson, 1994). To this end, it is imperative that all group members participate actively, exchange information, and construct knowledge collaboratively during a promotive interaction (e.g., Johnson & Johnson, 2009). Cooperating partners should also engage in grounding behaviors such as planning, monitoring, and coordination of their reasoning, strategies, and all social and task-related activities to reach a common goal (Erkens, Jaspers, Prangsma, & Kanselaar, 2005). In addition, students need to engage in high-quality helping behavior: Group members should ask for, give, and receive elaborate help during peer interaction. Asking precise questions and giving and receiving detailed explanations stimulates cognitive restructuring as it enables group members to identify and correct possible flaws or misconceptions in their reasoning (e.g., Gillies, 2014; Webb, 2013).

Students' perceptions of cooperative learning are closely related to their motivation to participate in a promotive interaction (e.g., Hijzen, Boekaerts, & Vedder, 2006). Hence, to be able to effectuate the success of cooperative learning, it is important to understand how students perceive and evaluate cooperative learning processes and, in particular, to gain insight into sources of variability in primary-school students' perceptions

of a specific cooperative learning activity as perceptions of one and the same activity can vary to a large extent. Both student-related (e.g., individual skills) and task-related characteristics (e.g., instructional design variables such as task complexity) are known to determine the nature and quality of interaction processes and can influence learning outcomes (e.g., De Hei, Strijbos, Sjoer, & Admiraal, 2016; Harkins & Petty, 1982; Schellens, Van Keer, Valcke, & De Wever, 2007), and it is not unlikely that students' perceptions of a cooperative learning activity also vary as a function of differences between students and characteristics of the task.

Below we will first provide an overview of research into students' perceptions of cooperative learning. Then, we will set forth why we have evaluated perspective-taking ability, instructional mode, task complexity, and individual and group learning outcomes as possible determinants of primary-school students' perceptions of cooperative learning activities.

Perceptions of Cooperative Learning Activities

Students' preferences for certain types of learning activities and other motivational processes, such as the beliefs students have about cooperative learning, can have a large impact on the quality of interaction and the successfulness of cooperative learning (e.g., Gillies, 2003; Hijzen et al., 2006). So and Brush (2008) report on a positive relation between students' perceptions of a blended collaborative learning activity and overall course satisfaction. More positive beliefs towards the utility value of cooperative learning can result in more cooperative behaviors (such as giving help), positive goal preferences, and strengthened group cohesion (Deutsch, 1949; Gillies, 2003; Hijzen et al., 2006). In addition, Gillies (2003) found that more positive perceptions of cooperative learning are closely related to students' motivation for active participation during group work. In a similar vein, Schellens, Van Keer, Valcke, and De Wever (2007) report that students' attitudes towards group discussions positively affect the quality of collaborative knowledge construction.

It can be concluded that perceptions of cooperative learning are related to various cooperative processes and behaviors. However, only a handful of studies describe factors underlying (university) students' perceptions. For example, Pauli, Mohiyeddini, Bray, Michie, and Street (2008) have pointed to experiences of task disorganization, lack of group commitment, conflicts, and negative working climate during group work as sources of undergraduate psychology students' negative perceptions of cooperative learning. Moreover, Strijbos, Martens, Jochems, and Broers (2004) found that the use of functional roles during group work can result in higher perceptions of group efficiency. However, it is likely that variability in perceptions is not only caused by processes taking place during the actual group work phase but, more broadly, by the accumulation of experiences throughout several phases that together comprise a cooperative learning activity. For example, the instruction students receive with regard to the task's content, desired cooperative behaviors, task complexity, and assessment of individual and group-level learning processes and outcomes are also important contextual characteristics that determine the quality and effectiveness of a cooperative learning activity (e.g., De Hei et al., 2016; Druckman & Bjork, 1994).

In addition, research on student perceptions has mostly been restricted in terms of methodological limitations. Students' perceptions of cooperative learning activities are often measured by means of self-report instruments (e.g., Cantwell & Andrews, 2002; Gillies, 2003; Gillies & Ashman, 1998; Hijzen et al., 2006; McManus & Gettinger, 1996). And, as described in the Supplement, it seems that even though the content of these instruments differs considerably, most instruments are characterized by (at least either one of) two limitations. First, most instruments focus on students' perceptions of the *quality of the design* of a cooperative activity and measure the extent to which to the five basic elements of cooperative learning (i.e., positive interdependence, promotive interaction, individual accountability, social skills, and group processing; Johnson

& Johnson, 2009) are implemented (e.g., Fernandez-Rio, Cecchini, Méndez-Giménez, Méndez-Alonso, & Preto, 2017; Gillies, 2003; Gillies & Ashman, 1998; Hijzen et al., 2006). As a consequence, these instruments provide no insight into the *quality of the cooperative processes* in which students engage during group work. Engagement in these behaviors facilitates a promotive interaction and students' reflections on their behaviors are an approximation of the quality of group work and should, therefore —in addition to attitudes and perceived utility value (e.g., Gillies, 2003; Hijzen et al., 2006)— be taken into account when evaluating sources of variability in students' perceptions of a cooperative learning activity.

Second, previous instruments measure students' perceptions of cooperative learning *in general* (i.e., "Group work is fun") or concern reflections after a longer period of time, but do not gauge what students experienced and felt during the specific cooperative activity they *just worked on* (e.g., Cantwell & Andrews, 2002; Fernandez-Rio et al., 2017; Gillies, 2003; McManus & Gettinger, 1996). However, given that the accuracy and specificity of information, memories, perceptions, and emotions associated with negative events fade or change in the course of time (e.g., Piolino, Desgranges, & Eustache, 2009; Walker & Skowronski, 2009), students' perceptions of a cooperative activity will be different when measured immediately after finishing group work compared to perceptions that are measured after a longer period.

To summarize; higher perceptions of cooperative learning are known to affect all kinds of cooperative processes and behaviors positively. However, only a few studies describe factors underlying students' perceptions, and all concern perceptions of university students. Furthermore, the instruments that are often used focus on the quality of the design and students' perceptions of cooperative learning *in general*. In the present study, we will use an instrument that specifically measures the quality of the cooperative processes that took place during the cooperative activity students just finished. Moreover, this study focuses on students in primary education, because many social skills needed for successful interaction, like the ability to take perspective, develop and improve over time.

1.2 Perspective-Taking Ability

Variability in students' perceptions of a cooperative learning activity could be a result of individual characteristics. Research on individual mechanisms underlying effective cooperative learning is in flux: Where prior research has predominantly focused on the relation between cognitive skills and the quality of cooperative learning (e.g., Gillies & Ashman, 1998; Slavin, 1993; Terwel, Gillies, Van den Eeden, & Hoek, 2001), more recent studies have started paying attention to understanding which *social* skills potentially affect the quality of cooperative learning (e.g., Buchs & Butera, 2015; Jones & Issroff, 2005). There is increasing evidence that one social skill in particular, namely perspective-taking ability, is essential for communicative functioning (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Nilsen & Fecica, 2011), and thus, could also play a role in primary-school students' perceptions of a cooperative learning activity. Perspective taking refers to the ability to view the world from another person's point of view. It pertains to mentally and emotionally placing yourself in someone else's shoes, adequate assessment of social situations and understanding its antecedents, and the ability to appropriately respond to expectations, qualities, thoughts, feelings, and emotions of another person (e.g., Cigala, Mori, & Fangareggi, 2015; Davis, 1983; Ruby & Decety, 2004). If conversational partners are unable to recognize their differences —for example with regard to ideas, perspectives, knowledge, or expectations— they are at risk of miscommunication, impasses, and even conflict, which can hinder a promotive interaction (e.g., Johnson, 1971, 1975; Pronin, Puccio, & Ross, 2002; Trötschel, Hüffmeier, Loschelder, Schwartz, & Gollwitzer, 2011). Perspective-taking ability enables conversational partners to continuously pay attention to each other's perspectives, helping them to understand the content and meaning of a message and place

it in context (e.g., Nilsen & Fecica, 2011). For example, the statement "*Well, that went really well*," can be interpreted as a compliment or as a sarcastic remark, depending on one's understanding of the situation and underlying intentions of the speaker. Adults with strong perspective-taking skills are better able to attune the content of their messages to the needs of the recipient (e.g., Feffer & Suchotliff, 1966; Johnson, 2015).

Perspective-taking ability can also result in a greater sense of self-other overlap that promotes group cohesion and could facilitate a more positive climate in which a promotive interaction can take place (Galinsky, Ku, & Wang, 2005). In addition, the extent to which someone experiences a certain social activity or conversation as agreeable or likable can be affected by one's capacity to understand that others possibly reason from a different point of view, and consequently, that disagreement does not necessarily reflect a hostile communication. However, the assumption that perspective-taking ability is related to perceptions of agreeability of a social activity in general, or in the context of cooperative learning in specific, is not yet empirically tested.

Moreover, it is important to take into account that perspective taking can be considered as a multi-dimensional construct as it appraises a cognitive and affective component (Cigala et al., 2015; Ruby & Decety, 2004). Cognitive perspective taking is conceptualized as the ability to *mentally infer, understand, and reason* about another person's motivations, intentions, and thoughts. Affective or social perspective taking strongly relates to empathy and concerns understanding others' *emotional states* and/or experiencing these emotions yourself. Previous works have shown a differential relation between these two types of perspective-taking ability and certain cooperative behaviors (see Mouw, 2018, for an overview). For example, social perspective taking enables trust building and supportive and respectful behaviors such as helping behaviors (Johnson, 1975), whereas cognitive perspective taking can facilitate problem-solving processes (Falk & Johnson, 1977). However, it is unclear if primary-school students' perceptions, in terms of engagement in cooperative behaviors and attitudes towards and perceived utility value of a specific cooperative learning activity can also be attributed to either type of perspective-taking ability.

1.3 Task Characteristics: Instructional mode, Task Complexity, and Learning Outcomes

In addition to individual characteristics such as perspective-taking ability, variability in students' perceptions of a cooperative learning activity could also stem from important task-related characteristics such as the instruction students receive, the complexity of the task, and the assessment of individual and group-level learning processes and outcomes (e.g., De Hei et al., 2016; Druckman & Bjork, 1994). For example, the instruction can be aimed at various aspects of the cooperative task, like the task's content, criteria for successful completion, or the cooperative behaviors prerequisite for a promotive interaction. Often, a teacher or peer models specific cooperative behaviors that could lead to successful task completion, but such training is not always effective for every student. Researchers hypothesize that such an instructional method is more conducive to students with stronger perspective-taking abilities as the effectiveness of modeling examples largely depends on model-observer similarity (Braaksma, Rijlaarsdam, & Van den Bergh, 2002; Van Gog & Rummel, 2010). For example, it could be that students with lower levels of perspective-taking ability are less susceptible to learning from a Coping example (in which both undesired and desired behaviors are modeled) because they have more difficulties understanding how engaging in undesired behaviors could affect (the well-being of) other group members. Consequently, observing a Coping example could negatively impact the quality of peer interaction. Hence, perceptions of a cooperative learning activity could vary as a function of the degree to which an instructional mode matches students' needs and social skills.

Another task-related characteristic that could shape students' perceptions of a coope-

rative learning activity is task complexity. Task complexity directly relates to the nature and structure of the task students are performing and influences the degree of successful task completion (Andersson & Rönnberg, 1995; Robinson, 2001). An increase in task complexity brings about an increase in processing demands and could result in experiences of incompetence, which at its turn can have a negative impact on individual contributions to the cooperative learning process. For example, working on relatively complex tasks (e.g., reading texts with many unfamiliar words that must be studied extensively) can result in feelings of incompetence. Consequently, an imbalance of participation and contribution is created as some group members feel they are unqualified to contribute in comparison to more able group members. If a student feels less competent than a peer, this student is not stimulated and possibly even impeded by the other's successes (Bandura, 1989; Lazarus & Folkman, 1984). In addition, perceived incompetence can result in quick consensus-seeking (e.g., you quickly agree with your peer because you feel you have no knowledge on this subject) or disputative argumentation in which a more competent peer tries to undermine the suggestions and ideas of a less competent peer (Asterhan & Schwarz, 2016). Limited information ex-change, quick consensus seeking, and disputative argumentation hinder processes of collaborative knowledge exchange, abstraction, and construction. Hence, fewer opportunities meaningful learning are created, resulting in lower individual and group learning outcomes and a decrease in students' attitudes towards and perceived utility value of a cooperative learning activity.

In contrast, if a learner values the task at hand as relatively easy (or at least thinks the task is doable given his/her previous competence) more positive expectations towards successful task completion are experienced which possibly could lead to higher learning outcomes and a more positive attitude towards and perceived utility value of the cooperative learning activity (i.e., enactive mastery experience; Bandura, 1989). Successful task completion can subsequently boost students' efficacy beliefs, indicating a reciprocal relation between attitudes and learning outcomes. However, as cooperative learning involves individual students working together in groups, this reciprocal relation is not only reflected in *individual* learning outcomes, but also in *group* learning outcomes such as the quality of a group product. This implies that measures of individual learning outcomes (i.e., a grade on a knowledge test), as well as group learning outcomes (i.e., the quality of a group product), should be taken into account when evaluating students' perceptions of a cooperative activity.

2. Method

2.1 Participants

A total of 206 fifth-grade students (103 girls, M_{age} = 10.65 years, age range: 9.25-12.00 years) from nine classes from six primary schools in the Netherlands participated in our four-session study. For the purposes of this study, students answered questionnaires that measured their cognitive and social perspective-taking abilities during Session 1. Participants worked together in one of the 53 groups of three (n = 6) to four (n = 47) students during Sessions 2, 3, and 4. Active written parental consent was given for each participating student. The ethics review board of the Institute of Education and Child Studies, Leiden University, approved of this study's procedures.

2.2 Training

To stimulate all students to engage in effective cooperative behaviors we showed an instruction video during the second session. In this video, ten-year-old peers modeled two sets of cooperative behaviors: In the first set, behaviors pertaining to basic communicative functioning (e.g., making eye contact, participating actively, turn-taking, etc.) were shown, followed by a set in which effective grounding and helping behaviors were modeled. A structured questioning technique was followed to support students in abstracting six main rules for effective cooperative learning

Table 1
Cooperative Learning Rules

Process	Rule(s)
Basic communicative functioning	Pay attention to each other by listening, giving compliments, active participation, making eye contact, giving others the opportunity to speak and finish their sentence, and encouraging group members to continue their reasoning.
Helping behavior	Ask specific questions if something is not clear or when you need help. Always provide help: Give clear answers, but preferably explanations if a peer asks a question. Explain something differently if your explanation is not understood the first time.
Grounding	Check your group members' frame of reference. Do all group members understand the task at hand? Do all group members understand your explanation? Do all group members agree with the decisions made? It is ok to disagree, but always give arguments and explain why you disagree.
Perspective taking*	Place yourself in the shoes of the main character during reading and actively take your peer's perspective during group work.

*Note. * This rule was presented only to students in the Perspective-Taking condition*

(see Table 1). These rules were written on a poster that was displayed in the classroom throughout all sessions.

2.3 Instructional Mode

We used three instructional conditions (i.e., Coping condition, Mastery condition, and Perspective-Taking condition) in which the two sets of desired cooperative behaviors and rules were modeled in a different way to explore the relation between instructional mode and perceptions of cooperative learning. Students in the Coping condition observed both desired and undesired cooperative behaviors in each set. Students in the Mastery condition watched a video in which only the desired cooperative behaviors were modeled in two sets. Students in the Perspective-Taking condition also watched this video, and thus, observed two sets of desired cooperative behaviors. The Perspective-Taking condition differed from the Mastery condition as students were additionally instructed to take perspective during the reading of texts and group work. "Actively take the perspective of the main character and your peer" was added as a seventh rule (highlighted in Table 1) and was written on the poster with the other six rules. All students practiced the rules that were modeled (i.e., desired cooperative behaviors) in their groups while working on a training task.

Cluster sampling was used to allocate classes as a whole to one of the three instructional conditions. Students from five classes from three different schools were allocated to the Coping condition (n =120, 55 girls, M_{age} = 10.58 years, age range: 9.50-11.92 years). Students from two classes from two schools were allocated to the Mastery condition (n = 43, 27 girls, M_{age} = 11.00 years, age range: 9.83-12.00 years). Students from two classes from two other schools who were allocated to the Perspective-Taking condition (n = 43, 21 girls, M_{age} = 10.47 years, age range: 9.25-11.83 years)

2.4 Cooperative Learning Task

The cooperative learning task used in our study comprised several part tasks and facilitated resource interdependence (Ortiz et al., 1994). Groups of students collaboratively started by reading and discussing a general introduction of a historical event. Group members then continued by individually reading a text in which a more elaborate description of the historical happening was presented from the perspective of one of four characters. Hence, each group member had different information at his or her disposal. As a result, students were challenged to actively discuss unique pieces of information from each of the four texts, reach a common ground, and complete their group assignment, which was to write a brochure for a museum. Students worked in the same groups and on similar tasks during the third and fourth sessions, but the topics of these tasks

differed. Students worked on the topic of child labor in the 19th century during the third session and learned about the storming of the Bastille during the fourth session.

2.5 Task Complexity

Most of the history teaching methods used in Dutch primary schools place great emphasis on historical events that have taken place in the Netherlands (i.e., in line with the Canon of Dutch History). As a result, students felt more related to, and had more background knowledge on, the topic of the third session (i.e., child labor) in comparison to the fourth session (i.e., storming of the Bastille). All texts were written in such a manner that students with a fourth-grade reading comprehension ability level and/or technical reading ability level should able to read the texts (CLIB; Evers, 2008); however, the texts about the storming of the Bastille were more complex to process than were the texts about child labor, as more unfamiliar words and longer sentences were used. As a result, students found it more challenging to complete the task of the fourth session successfully.

2.6 Individual Learning Outcomes

Students filled out a 10-item knowledge test at the end of each cooperative learning session. Seven open questions and one multiple-choice question assessed factual knowledge or general information incorporated in all four texts. Students also had to answer two integration questions that could be answered by combining unique pieces of information that were presented across the four texts. If students decided to include information presented in only one of the texts, they could only give a partial solution. A point was given for each correct answer. A maximum test score of 11 points could be obtained for the assessment of students' knowledge regarding child labor in the 19th century because one of the ten questions comprised an 'a' and 'b' part. A maximum of 15 points was allocated to the test assessing students' knowledge of the storming of the Bastille. This test included seven questions for which, if answered correctly, one point was given. Two questions comprised an 'a' and a 'b' part for which two points could be obtained. One of the integration questions required students to elaborate on the point-of-view of the four main characters, for which a total of four points could be awarded.

The lead author and an independent researcher blind to the aims of this study marked the tests individually and agreed on 95.91% of the markings of the individual test items measuring students' knowledge regarding child labor in the 19th century, and on 97.82% of the test items assessing students' knowledge on the storming of the Bastille. These individual learning outcomes (i.e., test scores) were used as a proxy measure for how well students understood the learning materials. Students were not informed of their test scores.

2.7 Group Learning Outcomes

A total of 20 points could be awarded to the written group products (i.e., brochures). For both historical events, a group of experts agreed on the 15 most salient details and facts presented across the texts, and a point was given for every fact included in the brochure. In addition, one point was awarded for mentioning the point-of-view of each main character. Because there were four main characters, a total of four points could be awarded. Last, if the brochure was well written, structured, and integrated information from all four texts, one point was awarded. If the text was structured logically, but at the same time it was apparent that each group member had written about his/her piece of information without checking for overlap, only half a point was rewarded. The first author and an independent researcher graded the brochures and agreed on 97.74% of the markings on the brochures on child labor, and 98.43% of the grades of the brochure on the storming of the Bastille. The group learning outcomes (i.e., the grade for the group product) was used as a proxy measure of group-level understanding of the texts. We did not inform students about the grades for the group product.

2.8 Cognitive Perspective Taking

We conceptualize cognitive perspective taking as the ability to mentally infer, understand, and reason about another person's motivations, intentions, and thoughts. Hence, it does not pertain to experiencing emotional aspects of social situations but indicates one's *cognitive capacity* to process and understand another's' point of view (e.g., Cigala et al., 2015). We used two subscales of the Interpersonal Reactivity Index (IRI; Davis, 1983), namely the fantasy and perspective taking scales as measures of cognitive perspective taking. Each subscale consists of seven items. Participants rated all 14 items on a 5-point Likert scale (1 = *does not describe me well*, and 5 = *describes me very well*). An example item is: "If two classmates disagree, I try to understand the point of view of both." The internal consistency of both seven-point scales is sufficient (fantasy: α = .81; perspective taking: α = .73).

Cognitive perspective taking entails a second distinct but important facet, namely Theory of Mind (Cigala et al., 2015; Wellman, 2018). Therefore, we decided to administer the Read the Mind in the Eyes-test (RME; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) in addition to the two IRI-scales. The child version of the RME measures how well children can attune to the mental state of others (Vogindroukas, Chelas, & Petridis, 2014). For all 28 items, children have to attribute the relevant state of mind after having been presented with a photograph of a person's eyes. The RME is a multiple-choice test: Participants have to select one of four given mental states, and a point is given for each correct answer. Internal consistency of this test is sufficient (α = .69; Vogindroukas et al., 2014).

2.9 Social Perspective Taking

Social perspective taking strongly relates to empathy and concerns understanding others' *emotional states* and/or experiencing these emotions yourself. The Revised Emotion Awareness Questionnaire (EAQ-30r; Rieffe, Oosterveld, Miers, Terwocht, & Ly, 2008) was used to assess social perspective-taking abilities with regard to emotion understanding. This 30-item questionnaire gives insight into how students think and feel about their emotional states. Recognition and comprehension of emotions are crucial for emotional processing, reasoning, and perspective taking (Ruby & Decety, 2004). Six aspects of emotional functioning (differentiating emotions, verbal sharing, not hiding, bodily awareness, other's emotions, and analyses emotions) were evaluated on a three-point Likert scale (1 = *not true*, 2 = *sometimes true*, and 3 = *often true*). The verbal sharing scale comprises three items, whereas the differentiating emotions scale comprises seven items; all other scales consist of five items. In the current sample, the internal consistency of the scales ranged between .65 and .76.

The empathic concern scale of the Interpersonal Reactivity Index (Davis, 1983) was administered as a second as a measure of social perspective-taking ability. The empathic concern scale measures emotional reactions and other-oriented feelings of empathy and sympathy (Davis, 1983). Participants rated this scale's seven items on a 5-point Likert scale (1 = *does not describe me well*, and 5 = *describes me very well*). An example item is: "I often have concerned feelings for people less fortunate than me." The Dutch child version of the seven-point empathic concern scale was sufficiently reliable (α = .72).

2.10 Reading Comprehension Ability

Because of the narrative nature of the task (i.e., reading and abstracting information from texts), we wanted to control for individual differences in reading ability as measured by the Cito-test reading comprehension (Egberink, Janssen, & Vermeulen, 2015). In our analyses, we used the corresponding national ability levels that range from level A to E. Level A represents the 25% highest scoring students; B represents the 25% of students who score on or just above average; C represents the 25% of students who score just below average; D represents the 15% of students who score well below average; and E represents the 10% lowest scoring students. For the current study, levels D and E are combined as these

scores together represent 25% of the norming population (as do the other scores).

2.11 Perceptions of Cooperative Learning

The 15 items of the Perceptions of a Cooperative Learning Activity Questionnaire (PCLA-Q) were used to measure students' perceptions of a cooperative learning activity they *just* engaged in instead of for cooperative learning in general. As described in the Supplement, a two-factor solution indicates that items in this questionnaire differentiate between a Group Processes scale and an Attitude/Utility value scale, $\chi^2(89) = 103.78$, $p = .14$; RMSEA = 0.04; SRMR = 0.05; CFI = 0.96; TLI = 0.95; AIC = 3951.16; BIC = 4130.83. The ten items that load high on the Group Processes scale measure students' perceptions of the quality of group work with regard to the extent to which students thought group members engaged in important cooperative behaviors such as grounding, helping behavior, and basic communicative functioning. An example item of the Group Processes scale is: "We first discussed how we would approach this task." Five other items together form an Attitude/Utility value scale which measures students' attitudes towards and perceived utility value of a specific cooperative learning activity. The Attitude/Utility value scale includes items such as "I enjoyed working on this assignment with our group." The items were rated on a three-point Likert scale (1 = *I completely disagree*, 2 = *I tend to agree*, and 3 = *I completely agree*). A three-point scale enables primary-school students to more easily interpret test items (Carifio & Perla, 2007; Mellow & Moore, 2014).

In the current sample, Cronbach's alphas of .84 (Group Processes) and .75 (Attitude/Utility value) were obtained for students' perceptions of the relatively easy cooperative learning task (i.e., child labor in the 19th century). Data on students' perceptions of the more complex cooperative learning task (i.e., storming of the Bastille) showed similar fit for both the Group Processes scale ($\alpha = .87$) and the Attitude/Utility value scale ($\alpha = .78$).

2.12 Procedure

All participating students were tested at their schools during four sessions taking place on multiple days. During Session 1, students answered questionnaires that measured their cognitive and social perspective-taking abili-

Table 2
Descriptive Statistics of Predictor and Outcome Variables

Variable	*M*	*SD*	Min.	Max.
Easy task (Session 3)				
PCLA-Q: Group Processes	2.31	0.44	1.00	3.00
PCLA-Q: Attitude/Utility value	2.35	0.52	1.00	3.00
Individual learning outcome (% correct)	67.33	20.15	0.00	100.00
Group learning outcome (% correct)	41.10	12.61	5.00	65.00
Complex task (Session 4)				
PCLA-Q: Group Processes	2.18	0.48	1.00	3.00
PCLA-Q: Attitude/Utility value	2.09	0.54	1.00	3.00
Individual learning outcome (% correct)	40.76	20.80	3.33	100.00
Group learning outcome (% correct)	44.09	15.41	5.00	80.00
Cognitive perspective taking	0.00	0.65	-1.74	1.48
Social perspective taking	0.00	0.47	-1.35	0.96
Reading comprehension	%			
A-level	31.1			
B-level	17.5			
C-level	21.4			
D/E-level	27.7			
Missing	2.3			

Table 3
Correlations between Predictor and Outcome Variables

		Complex task						
	Variable	1	2	3	4	5	6	7
1	Easy task Group processes	—	.69**	.25**	.40**	-.12	.17*	.09
2	Attitude/Utility value	.66**	—	.19**	.25**	-.04	.11	-.02
3	Individual learning outcome	.11	.12	—	.21*	- 55**	.16*	-.01
4	Group learning outcome	.29**	.26**	-.04	—	-.18**	.12	.01
5	Reading comprehension	.02	.06	-.39**	-.03	—	-.18*	-.05
6	CPT	.18*	.10	.08	.05	-.18*	—	.59**
7	SPT	.24**	.18*	-.02	-.03	-.05	.59**	—

*Note. Correlations for the complex task are presented above the diagonal, and correlations for the easy task are presented below the diagonal. CPT = cognitive perspective taking. SPT= social perspective taking. *p < .05. **p < .01.*

ties. Session 2 took place a week after Session 1. At the start of this second session, students received training on effective cooperative behaviors and rules. Students then practiced these rules and behaviors while working on a training task. This was similar to the 40-minute tasks performed during the third (i.e., child labor in the 19th century) and fourth (i.e., storming of the Bastille) cooperative learning sessions. The task was first to read a general introduction in their groups. Students then individually read a text in which the historical event was described from one of four perspectives. Part of the cooperative learning task was to write a brochure that integrated information presented in the four texts. Students worked together in the same groups during these all three cooperative learning sessions that took place in three consecutive weeks. An individual test was administered immediately after each episode of group work. After completing the individual test that took a maximum of 15 minutes to complete, students filled out the PCLA-Q. Most students were able to fill out the PCLA-Q in under 10 minutes.

2.13 Statistical Analyses

Because perspective-taking ability is a composite construct comprised of several distinct aspects, it was first examined if (items of) all these scales can be considered as an approximation of either cognitive or social perspective-taking ability. This is especially the case for cognitive perspective taking whose facets are not necessarily highly intercorrelated but need to be seen as a whole to ensure content validity. A second-order CFA was used to test whether the items in the subscales loaded on their intended constructs and whether these subscales could be subsumed in a higher order cognitive perspective-taking factor. A WLSMV-estimator (Muthén & Muthén, 2010) was used to account for the ordinal (IRI) and dichotomous (RME) measurement level of the items. The CFA confirmed that the RME, IRI fantasy, and IRI perspective taking can be seen as distinct factors whose correlation can be ascribed to a higher order latent cognitive perspective-taking construct, $\chi^2(776) = 798.76$, $p = .28$; RMSEA = 0.01; WRMR = 0.93; CFI = 0.94; TLI = 0.93. For social perspective-taking, an EFA was conducted as these scales are substantially and theoretically more similar in the measurement of constructs. The results support a social perspective-taking factor comprising the six EAQ scales and the IRI empathy scale, $\chi^2(14) = 22.04$, $p = .08$; RMSEA = 0.10; SRMR = 0.06; CFI = 0.89; TLI = 0.77. We then normalized students' scale scores and calculated a cognitive perspective-taking score by averaging scores on the RME and the IRI fantasy and IRI perspective-taking scales, and a social perspective-taking scale score was calculated by averaging students' ratings on the six EAQ scales and the IRI empathy scale.

Then, multilevel analysis was performed because variables at the individual level and the group level serve as predictors of students' perceptions of a cooperative activity (e.g., Hox, 2010). Mplus 7 was used to evaluate whether students' scores on each of the two PCLA-Q scales (e.g., Group Processes and Attitude/Utility value) could be predicted by cognitive and social perspective-taking ability and test scores on the knowledge tests (i.e., individual learning outcomes) as within-level variables and by instructional mode and grades for the group product as between-level variables. Scale scores were calculated for students' ratings of the items of the Group Processes scale and on ratings of the items of the Attitude/Utility value scale. This was done for both the easy and the complex task. The three instructional conditions were dummy coded with the Mastery condition serving as the baseline condition. Because of the narrative nature of the task, we wanted to correct for reading comprehension ability by including the reading-comprehension levels as a predictor at the individual level. To be able to compare the contribution of individual learning outcomes across tasks, we used the percentage of correct answers instead of absolute scores. The same was done for the group learning outcomes. The descriptive statistics of all predictor and outcome variables are presented in Table 2, and their correlations are presented in Table 3 for both the easy and complex task. Two separate analyses were run to compare the model fit and the parameter estimates of the easy task with the estimates of the complex task. Model fit was evaluated using the cut-off values suggested by Hooper, Coughlan, and Mullen (2008).

3. Results

3.1 Predictors of Students' Perceptions of an Easy Task

We first examined if individual students' perceptions of an easy cooperative activity can be predicted by social and cognitive perspective-taking ability, instructional mode, individual learning outcomes, group learning outcomes, and reading comprehension ability. The intra-class correlation of the baseline model shows that 35.53% of the total variance in the Group Processes scale scores and 23.48% of the total variance in the Attitude/Utility value scale scores resides at the group level, supporting the use of a multilevel model. A full model comprising all first- and second-level predictors was run, however, as this resulted in a just-identified model, an additional parameter needed to be fixed to obtain an identified model (Bollen, 1989). As the instructional conditions did not significantly contribute to the full model, we fixed the parameter estimate of one of the instructional conditions (i.e., Coping condition) to zero. The intra-class correlations of the final model show that the predictors of the final model could explain 9.31% of the total variance in the Group Processes scale scores and 10.81% of the total variance in the Attitude/Utility value scale scores. This model provided a reasonably good fit to the data, $\chi^2(2) = 6.54$, $p = .06$; RMSEA = 0.10; SRMR between = 0.01; SRMR within = 0.05; CFI = 0.97; TLI = 0.75; AIC = 394.64; BIC = 459.79. Although the RMSEA and TLI indicate that this model could be improved, none of the non-significant paths were deleted to be able to compare the parameter estimates of the easy task to those of the complex task.

For the Group Processes scale, a value of 2.29 was predicted, indicating that the majority of students tended to agree that grounding processes, helping behaviors, and basic cooperative behaviors sometimes or most of the times occurred. Further examination of Table 4 shows that, on average, each unit increase in the social perspective-taking scale brings about a 0.18-point increase in the Group Processes scale score. Each unit increase in the grades for the group product results in an increase of 0.01 in the Group Processes scale ratings.

An intercept of 2.28 was found for the Attitude/Utility value scale. This implies that the majority of students also tended to agree with the statements indicating a generally positive attitude towards and perceived utility value of the relatively easy cooperative learning activity. At the individual level, the only

Table 4

Standardized Regression Coefficients, Standard Errors, and Significance Levels Easy Task

Parameter	Estimate	Standard Error	*p*-value
PCLA-Q: Group processes			
Intercept	2.294	0.056	< .001
Individual learning outcome	0.001	0.002	.374
Cognitive perspective taking	0.029	0.042	.484
Social perspective taking	0.183	0.066	.006
Reading comprehension	0.028	0.020	.160
Group learning outcome	0.011	0.003	< .001
Condition: Coping[a]	0.000	0.000	n.a.
Condition: Perspective taking	-0.103	0.118	.379
PCLA-Q: Attitude/Utility value			
Intercept	2.276	0.056	< .001
Individual learning outcome	0.003	0.002	.170
Cognitive perspective taking	0.053	0.065	.414
Social perspective taking	0.142	0.092	.125
Reading comprehension	0.055	0.024	.024
Group learning outcome	0.011	0.003	< .001
Condition: Coping[a]	0.000	0.000	n.a.
Condition: Perspective taking	-0.035	0.108	.748
	Random Parameters		
PCLA-Q: Group Processes	0.043	0.017	.011
PCLA-Q: Attitude/Utility value	0.043	0.022	.085

Note. [a]*Parameter estimate fixed to 0.*

Table 5

Standardized Parameter Estimates, Standard Errors, and Significance Levels Complex Task

Parameter	Estimate	Standard Error	*p*-value
PCLA-Q: Group processes			
Intercept	2.193	0.057	< .001
Individual learning outcome	0.002	0.002	.223
Cognitive perspective taking	0.057	0.044	.199
Social perspective taking	0.064	0.076	.394
Reading comprehension	0.022	0.025	.381
Group learning outcome	0.013	0.003	< .001
Condition: Coping[a]	0.000	0.000	n.a.
Condition: Perspective taking	-0.146	0.106	.170
PCLA-Q: Attitude/Utility value			
Intercept	2.041	0.057	< .001
Individual learning outcome	0.003	0.002	.184
Cognitive perspective taking	0.120	0.060	.047
Social perspective taking	-0.091	0.078	.243
Reading comprehension	0.048	0.027	.079
Group learning outcome	0.009	0.003	.004
Condition: Coping[a]	0.000	0.000	n.a.
Condition: Perspective taking	-0.020	0.113	.860
		Random Parameters	
PCLA-Q: Group Processes	0.063	0.024	.010
PCLA-Q: Attitude/Utility value	0.058	0.024	.014

Note. [a]*Parameter estimate fixed to 0.*

significant predictor was reading comprehension. Each standard deviation decrease in levels of reading comprehension brings about an increase of 0.06 points on the Attitude/Utility value scale. Each unit increase in the grades for the group product resulted in a 0.01-point increase in the Attitude/Utility value scale score.

3.2 Predictors of Students' Perceptions of a Complex Task

The same was done on the data of the complex task. The intra-class correlation of the baseline model shows that 49.78% of the total variance in the Group Processes scale scores and 27.55% of the total variance in the Attitude/Utility value scale scores resides at the group level, supporting the use of a multilevel model. To enable comparison of the parameter estimates of the complex task to those of the easy task, we fixed the parameter estimate of the Coping condition to zero. The resulting model (Table 5) provided a good fit to the data, $\chi^2(2) = 0.32$, $p = .85$; RMSEA = 0.00; SRMR between = 0.01; SRMR within = 0.002; CFI = 1.00; TLI = 1.10; AIC = 392.48; BIC = 451.12. The intra-class correlations of this final model indicate that the addition of predictors to the model led to a 27.55% decrease of the total variance in the Group Processes scale scores, and a 5.25% decrease of the total variance in the Attitude/Utility value scale.

Table 5 shows that students on average scored 2.19 points on the Group Processes scale, indicating that the majority of students tended to agree that grounding processes, helping behaviors, and basic cooperative behaviors sometimes or most of the times occurred while working on a complex task. The significant regression coefficient for group grade implies that, on average, a unit increase in the grades for the group product brings about a 0.01 increase in the Group Processes score. For the Attitude/Utility value scale, an average intercept of 2.04 was predicted, suggesting that a majority of students had a neutral attitude towards and perceived utility value of the complex cooperative learning activity. Two predictors demonstrated a significant positive effect on the Attitude/Utility value scores, namely group learning outcomes ($B = 0.01$, $p = .004$) and cognitive perspective-taking ability ($B = 0.12$, $p = .05$).

4. Discussion

This study aimed to understand how primary-school students perceive and evaluate cooperative learning processes and to gain insight into student-related and task-related sources of variability in their perceptions of a cooperative learning activity. Specifically, we examined if students' perspective-taking abilities, instructional mode, and individual and group-level learning outcomes are predictors of students' perceptions of relatively easy and more complex cooperative learning activities. Students' perceptions of the quality of group work and their attitudes towards and perceived utility value of the cooperative learning activities were measured by the PCLA-Q.

4.1 Student-Related Characteristics

With regard to the first student-related characteristic, we found a differential effect of cognitive and social perspective-taking ability on students' perceptions of a cooperative learning activity. Our results suggest that the contribution of cognitive and social perspective-taking ability depends on the complexity of the task. Specifically, higher scores on measures of social perspective-taking ability are related to higher scores on the Group Processes scale of an easy task, whereas stronger cognitive perspective-taking ability is related to higher scores on the Attitude/Utility value scale of a complex task. In other words, students with stronger social perspective-taking abilities had more positive perceptions regarding the occurrence of effective cooperative behaviors (such as grounding, helping behavior, and basic communicative functioning) during group work as compared to students with lower perspective-taking abilities, however, only when working on easy tasks. In addition, we found that cognitive perspective-taking ability plays a role when working on a more complex task, specifically with regard to students' attitudes towards and perceived value of a cooperative learning activity.

Our findings advance previous research (e.g., Cigala et al., 2015; Falk & Johnson, 1977; Johnson, 1975) because they suggest that when working on an easy task, not only actual engagement with certain cooperative behaviors, but also *the perceptions* of the occurrence of these cooperative behaviors can be related to emotional understanding and empathy (i.e., social perspective-taking ability). Because students understood the subject matter and felt safe to contribute, working on an easy task possibly facilitated a positive climate with a low occurrence of conflict, resulting in a more agreeable cooperation with a positive affect (as measured, for example by PCLA-Q items such as "we helped each other" and "we quickly agreed on what to write in our brochure"). It can be reasoned that these experiences are strengthened especially for students with stronger social perspective-taking abilities because of their empathic susceptibility towards group members' emotions (e.g., conscious or unconscious induction of other's emotional states; Schoenewolf, 1990).

We controlled for levels of reading comprehension as a second student-related characteristic. The results show that students with lower levels of reading comprehension on average reported a more positive attitude towards and perceived utility value of an easy cooperative learning task. Students with lower levels of reading comprehension ability possibly felt that working with more capable peers enabled them to comprehend the subject matter, as these more competent peers shared the information written in their texts with the whole group. Interestingly, as the complexity of the task increases, the positive relation between lower levels of reading comprehension and attitudes towards and perceived utility value is no longer supported. It could be that the complex task proved to be a challenge for both less and more competent readers, and as a result, the more competent readers could no longer take the lead in the information exchange or facilitate the learning process of less competent readers (e.g., Asterhan & Schwarz, 2016; Lazarus & Folkman, 1984).

4.2 Task-Related Characteristics

Regarding the first task-related characteristic, instructional mode, we found no evidence that students in the three instructional conditions differed in their perceptions of easy and more complex cooperative learning activities with regard to the occurrence of effective cooperative behaviors during group work or their attitude towards and perceived utility value of these activities. This is interesting because previous research has shown that types of modeling examples can yield different interaction processes and learning outcomes as a function of individual characteristics and needs (e.g., Braaksma et al., 2002; Mouw, Saab, Pat-El, & Van den Broek, 2018; Van Gog & Rummel). The findings of the current article suggest a discrepancy between students' *perceptions* and the *actual occurrence* of cooperative behaviors during group work. However, in the present study, we did not measure the absolute frequency at which each group member participated or contributed to the group processes. Instead, the Group Processes scale includes information on students' perceptions of the extent to which group members participated actively. Phielix, Prins, and Kirschner (2010) found that students' perceptions on peer performance are not always realistic, and therefore, an interesting direction for future research would be to compare episodes of interaction taking place while working on easy tasks with episodes of interaction taking place while working on complex tasks. This way, it is possible to delineate if students merely perceive a lower occurrence of certain cooperative behaviors when working on a complex task, or that working on more complex tasks indeed decreases engagement in essential cooperative behaviors (which could explain lower learning outcomes reported in previous studies).

Regarding the second task-related characteristic, learning outcomes, we found that higher group learning outcomes contribute, albeit to a small extent, to students' perceptions of their engagement in cooperative behaviors and attitudes towards and perceived utility value of both easy and complex cooperative learning activities. In contrast,

we found that individual learning outcomes are not a source of differences in students' perceptions of engagement in cooperative behaviors or attitudes towards and perceived utility value of easy and complex cooperative learning tasks. Previous studies have pinpointed self-efficacy (i.e., a learner's beliefs on his or her ability to accomplish a task) as a predictor of individual performance (i.e., Bandura, 1989; Pintrich, 1999), and collective efficacy as a predictor of group performance (e.g., Baker, 2001; Gully, Incalcaterra, Joshi, & Beaubien, 2002; Katz-Navon & Erez, 2005). The findings of the present study seem to suggest that when learning is situated in a social context, it is also valuable to take into account group learning outcomes when the goal is to understand individual students' attitudes towards and perceived utility value of cooperative learning activities.

The absence of a relation between individual learning outcomes and students' attitudes towards and perceived utility value of a cooperative learning activity could also be explained by the fact that we did not inform students about their grades during the cooperative learning activity. Although this was also the case for the group learning outcomes, students were able to evaluate the quality of their group product based on the criteria for successful completion that were described in the group assignment. For the individual test, however, no indication of sufficient performance was given, which could have made it difficult for students to evaluate whether or not a specific cooperative learning activity indeed benefitted their learning and resulted in a good grade. Future research should, therefore, develop appropriate methods for informing students on their performance *during* cooperative learning, if the goal is to understand the relation between individual and/or group-level learning outcomes and students' attitudes towards and perceived utility value of cooperative learning activities that vary in task complexity.

4.3 Concluding Remarks

The results of this study help identify potential student- and task-related characteristics that can help understanding sources of variability in students' perceptions of cooperative learning activities. Even though some effects are small, manipulating these variables is low-cost and the various small effects might hypothetically have a compounded effect (or interaction effect) worth exploring in future studies. First, we found that as the complexity of the cooperative task increases, the effect of *social* perspective-taking ability on students' perceptions of engagement in cooperative behaviors diminishes, whereas the importance of cognitive perspective-taking ability becomes more pronounced. Given that students' perspective-taking abilities vary considerably and continue to mature during adolescence, future work should further examine how the differential effect of types of perspective-taking ability changes over time as a function of students' experiences with social interaction. Second, there is a differential effect of learning outcomes on students' perceptions of a cooperative activity depending on the level of measurement: Group learning outcomes, but not individual learning outcomes, is a positive predictor of both PCLA-Q scales, irrespective of task complexity. Hence, when learning is situated in a social context, a greater emphasis on the contribution of group learning outcomes as compared to individual learning results on students' attitudes towards and perceived utility value of group work is needed. Together, the results of this study show that students' perceptions of a cooperative learning activity can vary between students and as a function of contextual variables, depending on students' cognitive and social perspective-taking abilities, group learning outcomes, and the complexity of the task.

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Samenvatting

Leerling- en taakgerelateerde voorspellers van percepties van basisschoolleerlingen over coöperatieve leeractiviteiten

Om het succes van coöperatief leren te kunnen effectueren, is het belangrijk om de percepties van leerlingen over specifieke samenwerkingsactiviteiten te begrijpen. De percepties die leerlingen over één en dezelfde coöperatieve leeractiviteit hebben kunnen namelijk sterk uiteenlopen. Om inzicht te krijgen in leerling- en taakgerelateerde bronnen van variabiliteit in de percepties die basisschool-leerlingen over een coöperatieve leeractiviteit hebben, is onderzocht of cognitief en sociaal inlevingsvermogen, de instructiemethode en individuele en groepsleerresultaten de percepties die leerlingen hebben over relatief gemakkelijke en complexere coöperatieve leertaken kunnen verklaren. Items uit de nieuw ontwikkelde PCLA-Q zijn gebruikt om percepties over de kwaliteit van groepswerk en de meerwaarde die een coöperatieve leertaak heeft voor het leerproces te meten. Multilevel-analyses tonen aan dat sociaal inlevingsvermogen de percepties over de kwaliteit van coöperatieve gedragingen verklaart, maar alleen wanneer aan een eenvoudige taak gewerkt wordt. Cognitief inlevingsvermogen verklaart variabiliteit in de attitudes die leerlingen hebben over de waargenomen gebruikswaarde van een complexe taak. Variabiliteit in leerlingpercepties is niet terug te leiden op verschillen in de instructiemodus. Er is sprake van een differentieel effect van leeruitkomsten: Het groepscijfer is een positieve voorspeller van de waargenomen gebruikswaarde en de percepties over de kwaliteit van coöperatieve gedragingen van zowel makkelijke als complexe taken. De individuele score op de kennistoets is daarentegen geen voorspeller van leerlingpercepties. Onze bevindingen suggereren dat de percepties die basisschoolleerlingen over coöperatief leren hebben variëren als functie van contextuele variabelen en leerlingkenmerken en in het bijzonder afhankelijk zijn van inlevingsvermogen, leerresultaten op groepsniveau en de complexiteit van de taak.

Kernwoorden: leerlingpercepties van coöperatief leren; inlevingsvermogen; instructiemodus; leerresultaten; taakcomplexiteit.

Supplement: Development and Validation of the Perceptions of a Cooperative Learning Activity-Questionnaire

1. Introduction

Students' perceptions of cooperative learning activities are often measured by means of self-report instruments (e.g., Cantwell & Andrews, 2002; Gillies, 2003; Gillies & Ashman, 1998; Hijzen, Boekaerts, & Vedder, 2006; Johnson & Johnson, 1990; McManus & Gettinger, 1996). The content of these instruments differs considerably, but most of the instruments are characterized by (either one of) two limitations: Many of the instruments (1) do not actually measure students' perceptions of important cooperative processes taking place during group work or (2) measure students' attitudes towards cooperative learning in general instead of towards a specific task.

The first limitation is that most instruments focus on students' perceptions of the quality of the *design* of a cooperative activity, as they often measure the extent to which to the five basic elements (i.e., positive interdependence, promotive interaction, individual accountability, social skills, and group processing; Johnson & Johnson, 1990, 2009) are implemented in a cooperative learning activity (e.g., Fernandez-Rio, Cecchini, Méndez-Giménez, Méndez-Alonso, & Preto, 2017; Gillies, 2003; Gillies & Ashman, 1998; Hijzen et al., 2006; Johnson & Johnson, 1990, 2009). Because of this focus, these instruments do not provide insight into the quality of the cooperative processes students engaged in during group work. For example, the instruments mentioned above do not evaluate if students engage in grounding processes and helping behaviors during group work, nor do they measure the extent to which students adhere to basic rules and behaviors, even though these behaviors are characteristics of high-quality cooperative processes (e.g., Erkens, 2004; Erkens, Jaspers, Prangsma, & Kanselaar, 2005; Johnson & Johnson, 2009; Webb, Farivar, & Mastergeorge, 2002). Engagement in these behaviors determines the quality of a promotive interaction and students' reflections on their behaviors are an approximation of the quality of group work and should, therefore —in addition to attitudes and perceived utility value (e.g., Gillies, 2003; Hijzen et al., 2006)— be taken into account when evaluating sources of variability in students' perceptions of a cooperative learning activity.

The second limitation is that previous instruments measured students' perceptions of cooperative learning *in general* (i.e., Group work is fun) and do not reflect what students experienced and felt during a *specific* cooperative activity they just worked on (e.g., Cantwell & Andrews, 2002; Gillies, 2003; McManus & Gettinger, 1996), even though the latter is more informative. For example, Fernandez-Rio, Cecchini, Méndez-Giménez, Méndez-Alonso, and Preto (2017) asked students to reflect upon cooperative learning activities that took place somewhere in the previous six months. However, the accuracy and specificity of information, memories, perceptions, and emotions associated with negative events fade or change over time (e.g., Piolino, Desgranges, & Eustache, 2009; Walker & Skowronski, 2009). Hence, students' perceptions of a cooperative activity will be different when measured immediately after finishing group work compared to perceptions that are measured retrospectively after a longer period. Furthermore, students' perceptions of and attitudes towards a cooperative activity vary task by task as a function of group composition, task type, task difficulty, and the subject students work on (e.g., Cohen, 1994; Harskamp, Ding, & Suhre, 2008). For example, if a student is not motivated for biology in general, the chances are that his/her attitude towards group work will be less positive when working on the topic of photosynthesis as compared to working together on a historical subject.

To summarize, to gain a comprehensive understanding of the conditions under which cooperative learning can reach its full poten-

tial, it is informative to measure primary-school students' perceptions of the quality of processes and behaviors essential for cooperative learning (i.e., grounding processes, helping behaviors, and basic rules) and to take into account students' attitudes towards and the perceived utility value of the cooperative activity they *just* engaged instead of for cooperative learning in general.

In this supplement, we describe two phases of the development of an instrument for measuring students' perceptions of engagement in essential cooperative behaviors (such as basic rules, grounding behaviors, and helping behaviors), their attitudes towards, and the perceived utility value of a cooperative learning activity in which they just engaged. In the first phase, we describe the selection and construction of items, whereas the psychometric properties of the *Perceptions of a Cooperative Learning Activity-Questionnaire* (PCLA-Q) are evaluated in the second phase.

2. Phase 1: Construction

The PCLA-Q was developed with the goal to gain insight in the quality of cooperative behaviors and processes (basic rules, grounding, and helping behaviors) taking place during, students' attitudes towards and perceived utility value of the completed cooperative activity. First, we selected suitable items from previous surveys. Items from the Feelings Towards Group Work questionnaire (Cantwell & Andrews, 2002), the Attitude Towards CL-scale (Hijzen et al., 2006) and the How I feel About Working in Groups at School survey (McManus & Gettinger, 1996), such as "I enjoy working in a group," and "I am often afraid to ask for help within my group" were selected to measure students' attitudes towards a cooperative activity and predisposition towards helping behaviors. Items that pertain to basic rules and behaviors such as "Group members gave each other time to talk and make suggestions" and "Group members seek help from each other" were selected from the Cooperative Learning Questionnaire (Johnson & Johnson, 1990) and the Behavior in the Small-Group Questionnaire (Gillies, 2003; Gillies & Ashman, 1998). We adjusted items from these questionnaires so that the statements refer to the specific cooperative learning activity just performed instead of perceptions towards cooperative learning in general. For example, the item "I enjoy working in a group" was changed to "I enjoyed working on this assignment with our group."

These selected items were complemented with newly formulated statements that concern grounding behavior, helping behavior, and basic rules as these constructs are not included in other instruments. This resulted in items such as "We have considered ideas from all group members" and "We first discussed how we would approach this task." In a similar vein, we have formulated items to measure the perceived utility value of the cooperative activity based on both individual learning outcomes and group outcomes. Items such as "By working in a group on this assignment, I have learned more than I would have learned individually" and "I think I have answered most of the test questions correctly" are informative regarding the perceived benefits of cooperative learning as compared to individual learning with regard to the extent to which students felt confident they mastered the learning materials and are satisfied with their learning outcomes.

As a last step of the construction-phase, we invited an expert group of teachers and educational researchers (n = 5) to discuss all statements because items from existing instruments had to be translated to Dutch. In addition, we wanted to make sure that all items were understandable and meaningful for fifth-grade students. Based on the responses of the expert group, minor adjustments were made, mostly pertaining to vocabulary. The resulting questionnaire comprises 17 items (presented in Table A1) that measure the extent to which individual students or group members engaged in essential cooperative behaviors, and gauges students' attitudes towards and the perceived utility value of a specific cooperative activity.

Many instruments suggest the use of a five-point Likert scale, however, following Carifio and Perla (2007) and Mellor and

Table A1
Items of the Perceptions of a Cooperative Learning Activity-Questionnaire

Item number	Aspect of cooperative process or behavior	Item
1	Basic communicative functioning	We all listened to each other.
2	Basic communicative functioning, Grounding	All group members participated actively. For example, everyone helped to decide on what to write.
3	Grounding	We quickly agreed on what to write in our brochure.
4	Attitude	I enjoyed working on this assignment with our group.
5*	Utility value, Attitude	Because we had to work in a group, I found it difficult to understand what we needed to do.
6	Utility value	By working in a group on this assignment, I have learned more than I would have learned individually.
7	Utility value	I think I have answered most of the test questions correctly.
8	Grounding	I have put forward many ideas and arguments.
9	Basic communicative functioning	During group work, we made eye contact.
10	Basic communicative functioning	We did not interrupt each other and let each other finish our sentences.
11	Utility value	I learned a lot from this assignment.
12	Basic communicative functioning	We gave each other compliments on a regular base.
13	Grounding	We have considered ideas from all group members.
14	Grounding	We first discussed how we would approach this task.
15*	Helping behavior	I was afraid to ask for my group's help.
16	Utility value	I am satisfied with our brochure.
17	Grounding, Helping behavior	I made an effort to understand what my group members meant.

*Note. *Reversed item.*

Moore (2014), we posit that primary-school students find it difficult to interpret items and quantify experiences on a five- or seven-point scale. The items were, therefore, rated on a three-point Likert scale (1 = *I completely disagree*, 2 = *I tend to agree*, and 3 = *I completely agree*). A three-point scale enables primary-school students to more easily differentiate between processes and behaviors that never, sometimes, or most of the times occur during group work.

3. Phase 2: Validation

The psychometric properties of the PCLA-Q were evaluated in a pilot study (72 girls, 61 boys, M_{age} = 10.60 years, age range: 9.83-12.25 years) in which students from seven classes from six Dutch primary schools participated. School directors of these schools located in the Western or Middle part of the Netherlands were contacted and asked if their fifth-grade classes were willing to participate in this study. Upon a positive reply, we sent the fifth-grade teachers information regarding this study's purpose and the data collection. Active written parental consent was given for each student participating in the pilot study.

The students partaking in this pilot study worked on the same tasks, filled out the same instruments, and completed the same tests as the students participating in the study described in the main article. However, participants of the pilot study worked together during two cooperative learning sessions instead of three because the main goal of the pilot study was to evaluate the psychometric properties of the PCLA-Q, instead of evaluating the effectiveness of the training or suitability of the tasks. Students in the pilot study worked on the topic of the storming of the Bastille during the third cooperative learning session and, thus, skipped the task on child labor in the 19th century.

4. Results

An Exploratory Factor Analysis (EFA) with oblique Geomin-rotation was performed in

Table A2
Fit Statistics for a One-, Two, Three-, and Adjusted Two-Factor Model

Statistic	One-factor[A]	Two-Factor[B]	Three-Factor[C]	Adjusted Two-Factor[D]
RMSEA	.09	.05	.04	.04
RMSEA CI	.07-.10	.03-.07	.00-.06	.00-.06
SRMR	.08	.06	.05	.05
CFI	.75	.92	.97	.96
TLI	.71	.89	.95	.95
AIC	4263.42	4202.28	4197.38	3951.16
BIC	4408.89	4393.36	4431.25	4130.83

Note. CI = confidence interval. [A] $\chi^2(119) = 231.03$, $p < .001$. [B] $\chi^2(103) = 137.88$, $p = .01$. [C] $\chi^2(88) = 102.99$, $p = .13$. [D] $\chi^2(89) = 103.78$, $p = .14$.

Table A3
Significant Factor Loadings for the Adjusted Two-Factor Solution with Geomin Rotation

Item number*	Factor 1: Group Processes	Factor 2: Attitude
1	.57	
2	.44	
3	.36	
4		.70
6		.50
7		.25
8	.28	
9	.64	
10	.63	
11		.63
12	.50	
13	.61	
14	.55	
15	--	--
16		.46
17	.55	

*Note. * Item number corresponds to the items presented in Table A1. Item 5 was omitted from the adjusted model because of the high standard error. Item 15 did not load on either of the two factors.*

Mplus 7 to test whether the items of the newly developed 17-item PCLA-Q represent distinct latent factors. The resulting scree plot of Eigenvalues supported the exploration of a one-, two-, and three-factor solution. The absolute, incremental, and parsimony fit indices of each of the three-factor solutions are presented in Table A2. A three-factor model fitted the data best, as all fit measures in the third column of Table A2 approximate the cut-off values suggested by Hooper, Coughlan, and Mullen (2008). However, one of the factors represents a negative wording effect of items 5 and 15, and the factor loading of item 5 had an extremely high standard error ($SE = 4.95$). This indicates that our participants did not understand this question, and therefore, we have deleted this item and run an adjusted two-factor model.

The resulting factor solution for the adjusted two-factor model fitted the data well (last column, Table A2) and is theoretically substantiated. Therefore, the adjusted two-factor structure is preferred over the one-factor solution. The corresponding factor loadings are presented in Table A3. Items loading on the first factor, *Group Processes*, reflect the cooperative processes and behaviors students engaged in during group work. These items are informative regarding the extent to which

students adhered to rules for effective group work (e.g., "We gave each other compliments on a regular base") and reflect grounding activities (e.g., "We first discussed how we would approach this task") and helping behavior (e.g., "I made an effort to understand what my group members meant"). The second factor, *Attitude/Utility value,* consists of items reflecting the utility value (e.g., "By working in a group on this assignment, I have learned more than I would have learned individually") and enjoyment of group work (e.g., "I enjoyed working on this assignment with our group").

5. Conclusion

The first aim was to develop an instrument that overcomes limitations in the applicability of scales and questionnaires commonly used to assess students' perceptions of cooperative learning (e.g., Cantwell & Andrews, 2002; Fernandez-Rio et al., 2017; Gillies, 2003; Gillies & Ashman, 1998; Hijzen et al., 2006; Johnson & Johnson, 1990; McManus & Gettinger, 1996). The resulting *Perceptions of a Cooperative Learning Activity-Questionnaire* (PCLA-Q) comprised seventeen items that measure several aspects of the cooperative learning processes: Basic rules, grounding behaviors, helping behaviors, attitude, and utility value.

The second aim was to examine the psychometric properties of the PCLA-Q. An EFA revealed an over-arching two-factor solution on which 15 items loaded. The PCLA-Q differentiates between a Group Processes scale and an Attitude/Utility value scale. Ten items loaded high on the Group Processes scale and measure students' perceptions of the quality of group work. These items gauge the extent to which students thought group members engaged in important cooperative behaviors such as grounding, helping behavior, and rules for basic communicative functioning. The five remaining items comprise the Attitude/Utility value scale, which measures students' attitudes towards and perceived utility value of a specific cooperative learning activity.

Configural invariance was reached as the factor structure (i.e., the existence of a Group Processes scale and an Attitude/Utility value scale) holds across samples, irrespective of the difficulty of the task (i.e., a replication on the data from the main study revealed a similar factor structure and loadings for both easy and difficult tasks). Hence, the dimensionality of the questionnaire is stable, even though metric invariance was not reached due to a relatively small sample size (Osborne & Costello, 2004). This implies that the PCLA-Q can be used to make global comparisons across samples and tasks (Gregorich, 2006). Moreover, only a limited number of items are included in the PCLA-Q, making it a robust and easy-to-use instrument suitable for the use in primary schools.

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