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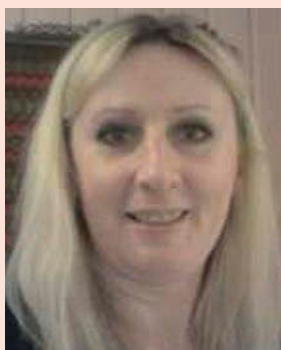
STUDENT LEARNING, CHILDHOOD & VOICES | REVIEW ARTICLE

Face-to-face promotive interaction leading to successful cooperative learning: A review study

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Abstract: The article presents a review of 34 studies conducted from 1995 to 2017 focusing on face-to-face promotive interaction (FtFPI) factors that may lead to successful cooperative learning (CL) in small groups, as guided by the following research question: “Which FtFPI factors lead to successful CL in small groups?” A manual and citation database search were used to find relevant studies. The findings indicate that students’ interpersonal behavior, their experiences and active participation in the CL process, communication and support to each other, and teachers’ influence on promoting students’ interaction leading to successful CL in small groups. Moreover, these factors may lead to students’ deep learning. However, the review suggests that systematic preparations must be made by both teachers and students if the CL is to be successful. Thus, more empirical research is needed to understand the complexity of students’ FtFPI and to investigate the development of FtFPI based on students’ and teachers’ experiences in small CL groups.

Subjects: Educational Research; Primary/Elementary Education; Secondary Education; Childhood; Classroom Practice



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PUBLIC INTEREST STATEMENT

The article presents a review of research on key factors of students’ face-to-face interaction that can lead to successful cooperative learning. Studies conducted from 1993 to 2017 are reviewed in search of factors that prove to be successful in promoting cooperative learning in schools. Thirty-four peer-reviewed articles were analysed where 13 studies were conducted in Europe, seven in Australia, five in Asia, five in the USA, two in Canada, one in Africa and one was a summary from different countries. The findings show that certain aspects of face-to-face student interactions lead to successful cooperative learning: students’ interpersonal behaviour, their experiences and involvement in cooperative processes, students’ communication and support, and teachers’ influence on promoting students’ interaction that may lead to deep learning. One main conclusion of this review is that teachers and students need to prepare for and to be educated in developing, supporting, and maintaining face-to-face interaction for successful cooperative learning.

Keywords: Cooperative learning; face-to-face promotive interaction; small group contexts; peer relationships

1. Introduction

The ability to cooperate effectively is a necessity if one is to succeed in a small cooperative learning (CL) group¹ across different subject areas (Gillies, 2003a). Whereas social interaction plays a major role in how children learn (Cohen, 1994), the quality of interaction in student groups is a strong predictor of learning gains (Cohen & Lotan, 1995). Thus, promotive interaction between co-learners is important for students' learning from each other in such a way that individuals encourage and facilitate the efforts of others to complete tasks so they can reach the group's goals (Johnson & Johnson, 1999). The common practices of the CL model do not merely include cooperation, but additional elements, such as positive interdependence, individual accountability, face-to-face promotive interaction (FtFPI), social skills, and group processing (Johnson & Johnson, 2002). All these elements could together influence the students' learning outcome and social gains. However, even with this potential, the factors promoting cooperative interaction in terms of students' FtFPI as a way of achieving successful CL remain unclear.

In the present review, we focus on students' FtFPI defined by Johnson and Johnson (1999) as a type of social interaction that promotes participation and contribution in group work among students while they are supporting, encouraging and praising each other's efforts to carry out their joint task. Based on the complex relationships between cooperating students, the review describes research findings by focusing on small CL groups and investigating which FtFPI factors may lead to successful students' learning during their joint activity.

For this aim, we use the following research question in this article:

Which FtFPI factors lead to successful CL in small groups? Furthermore, in this review the discussion is framed according to small CL groups, existing gaps are identified and findings from various studies are synthesized in order to point out the FtFPI factors that lead to successful CL in various educational situations and contexts.

It is widely accepted that simply placing students in groups does not guarantee rich cooperation (Johnson & Johnson, 1999). Baines, Blatchford, and Webster (2015) state that students sit in groups, but rarely work as a group. Students need to experience positive interdependency with their peers, to be aware of individual accountability through a group learning process, to encourage their peers face-to-face to interact in a group setting, and to be reflective about their group dynamics during CL. Moreover, several conditions, such as group composition, group size, and learning tasks support students' interaction and learning benefits within small CL groups (Cohen, 1994; Gillies, 2003a).

Whilst the teachers in a CL group setting play a crucial role in fostering students' interaction so that it is beneficial for learning (Cohen, 1994), teachers need to be prepared for CL if they are to apply it successfully in their classrooms (Sharan, 2010). Bearing this in mind, the teacher's role will be discussed in the last section presenting the findings, where the teacher is seen as an important actor who has influence on students' FtFPI within CL group (Gillies & Boyle, 2010; Sharan, 2010).

The next section will describe the methods used to search for and analyze relevant articles, and the rationale for the inclusion and exclusion of studies. The section after "methods" will present the findings according to five categories.

2. Methods

2.1. Rationale

The aim of the review is to investigate and discuss ways FtFPI may lead to successful CL in small groups. The search was restricted to empirical studies including quantitative, qualitative, and mixed method analyses.

The starting point for the literature search was set at 1993 after Battistich, Solomon, and Delucchi (1993) discovered that the effects and outcomes of CL depended on the quality of the group interaction and not on its frequency.

The literature search was conducted from May to December 2017, using ERIC, SCOPUS, and the ISI Web of Science databases, in addition to manual and citation searches. A manual search was conducted in relevant international peer-reviewed journals relating to the use of CL and students' interactions in small CL groups according to the below-mentioned criteria. The following journals were selected by means of thread searches of reference lists or through citation in already selected articles: *Journal of Education and Practice*, *Educational Psychology*, *Teachers and Teaching*, *Childhood Education*, and *Research in Education*. The searches were confined to the period from 1993 to 2017 using the search strings "cooperative learning" OR "collaborative learning" AND, "peer interaction", OR "face-to-face interaction", "peer relationships", "peer mediation" AND "small groups" NOT "higher education". We obtained 1038 hits for all of the search strings together. Delimiting the search to title, abstract and keywords in the databases was our deliberate search strategy to lower the number of publications and to make the information search more precise (Savolainen, 2016). Then, we selected a set of 58 articles for thorough reading. After reading all 58 articles, a final set of 34 articles were chosen as relevant for the review.

2.2. Inclusion and exclusion criteria for selection of publications

We narrowed the number of publications down by specifying the selection criteria. One main inclusion criterion was that the publications should be peer-reviewed articles in which students were selected as the main informants, or were main informants together with teachers, in primary and secondary schools. The studies had to address small CL groups, including the process of interaction when aiming for social or academic gains. Only empirical articles about CL were included. Furthermore, the articles about collaborative learning (COL)² were included if their research findings pointed out the significance of students' interaction processes. Publications such as policy documents, books, reports, and so on were excluded. We also excluded articles that dealt with tertiary education, engineering and teachers' professional development in CL and CL out of classroom settings.

This resulted in 34 peer-reviewed articles of which 12 were discovered through citation search, i.e. through searching in the list of references in the articles found through the database search.

2.3. Analysis

After the initial coding and iterative readings of the 34 publications, the authors organized selected articles for writing the literature review (Boote & Beile, 2005) with the aim of answering the research question. All in all, 13 of these articles employed quantitative methods, 12 employed qualitative methods and nine were mixed-method studies. Of the 34, 13 were conducted in Europe, seven in Australia, five in Asia, five in the USA, two in Canada, one in Africa and one was a review of several empirical studies from all around the world.

A structured and compressed format was used to extract information from the mapped articles, where feature maps (Hart, 2001) were used according to their purpose, research questions, methodology, sample, variables/key concepts, and results/main findings. This gave the researchers an overview of the articles. This structured format was used to extract findings from the reviewed articles so they could be categorized and discussed in terms of FtFPI interaction that may lead to

successful CL in small groups. The analytical process was related to categories and subcategories so that similar data have similar conceptual labels (Strauss & Corbin, 1990). Then, the findings were summarized and analyzed under headings corresponding to their main categories: (1) interpersonal behavioral factors, (2) students' experiences and the FtFPI process (3) students' communication and support (4) FtFPI leading to deep learning, and (5) teachers' influence on students' FtFPI.

3. Findings

To answer the research question on FtFPI factors that may lead to successful small CL groups, we developed five categories outlined in the following subsections. Appendix 1–5 refer to each category, summarizing the studies and the key findings that the authors reviewed.

3.1. Interpersonal behavioral factors

The first category, the interpersonal behavioral factors (see Appendix 1), refers to the features of helping behavior as a sense of other group members' needs. Gillies and Ashman (1995) found that students who were trained in cooperating with others were more helpful to each other than their peers were in the untrained groups. Furthermore, Gillies (2002) reported that the students who were trained in helpful skills, even two years previously, were more cooperative and supportive to each other than their untrained peers.

Similarly, Gillies and Ashman (1998) showed that students in structured groups provided more elaborate help and an understanding of the needs of others, demonstrated more willingness to work together, to listen to each other (Gillies, 2003b), and share resources in the structured group (Gillies, 2003a) than their peers in the unstructured groups did.

Webb, Farivar, and Mastergeorge (2002) pointed out that the responsibility of students to ask for help and provide relevant help produced effective helping behavior. The authors described four conditions that affect students' interaction as potential help seekers and help givers: establish positive norms for group work, structure tasks in ways that support learning, model desired behavior, and monitor group work. Gillies (2006) found that teachers' facilitative verbal behavior provided social models for students who then gave more explanations and detailed responses to other students' requests for help. However, Magnessio and Davis (2010) argued that students were often not aware of their interpersonal behavior during group interaction and they struggled to complete a group task successfully due to their lack of self-awareness. Similarly, Yoruk (2016) reported that students' awareness of their learning environment, together with self-efficacy and self-confidence, affected students' cooperative behavior.

3.2. Students' experiences and the FtFPI process

Having reviewed the category of interpersonal behavioral factors, we now turn to the topic of students' experiences and the FtFPI process (see Appendix 2), which may be interrelated in a small CL group context.

Otienoh (2015) found that students' involvement with mixed abilities status in the group interaction created their inclusive experiences in a cooperative process. However, there was less CL interaction due to unclear procedural instructions and teacher monitoring because this was the first time students and teachers were working in this type of learning process. Genç (2016) focused on the importance of students' experience in and understanding of how to work cooperatively with others. He pointed out that students' achievements in science content rely on the basic principles of CL. However, this researcher found that students' FtFPI might face a problem when it comes to adopting a positive attitude towards the group.

Oortwijn, Boekaerts, Vedder, and Fortuin (2008) demonstrated that even with minimal prior knowledge about the CL model, and where neither the teachers nor the students had prior CL experience, structured cooperative groups can reduce inter-ethnic bias in multi-ethnic teams.

Similarly, Mary (2014) found that cooperative activities provided a context for getting closer to each other, becoming familiar with shy children or children who were new to the class. Such activities increased empathy and understanding among students, helping some to overcome relationships of conflict, which they previously had had negative experience of.

Mueller and Fleming (2001) pointed out four key findings in shaping the students' involvement and their experiences of the CL process. First, relationships between boys and girls may have a pivotal role in terms of their language competency and social leadership. Second, students found ways to cooperate even if they lacked the time to organize themselves while they were working together. Third, students' self-evaluations were valuable to the teacher for assessment purposes. Finally, the study noted that the teacher played an important role in establishing CL conditions and sustaining the process.

3.3. Students' communication and support

Having discussed the role of students' experiences and FtFPI process in small CL groups, this section focuses on students' communication and support (see Appendix 3).

Golub and Buchs (2014) reported that students who were prepared for cooperation in a cooperative controversy displayed more support, actively listened, clearly asked more questions, and paid more attention to others than the pairs who were given simple instructions. Gnadinger (2008) claimed that students provided support for one another by questioning, providing feedback, and instructing. In particular, this study pointed out that feedback often helped a student to make substantial gains to understand the group task in CL.

Quebec-Fuentes (2013) identified ten issues with students' supportive communication grouped into three categories: promoting group communication, improving the quality of communication, and altering the sociocultural norms of classroom learning. However, persistent practice was necessary if the teacher was to develop a cooperative-discourse culture. Similarly, Ross (1995) found that the effect supporting the students to employ feedback procedures was attributed to three factors: (1) the feedback strengthened helpfulness norms, (2) it increased the students' skills in asking for and giving help, and (3) their feelings of self-efficacy could be enhanced. Webb and Mastergeorge (2003) noted that help givers had to provide detailed explanations of the material and to support the help receiver to apply the received help by monitoring the peer understanding. Accordingly, the teachers had responsibilities to encourage and facilitate the active roles of both. However, Kershner, Warwick, Mercer, and Kleine Staarman (2014) pointed out that it was crucial to manage group work learning if cooperative rules were to be developed from the students' ideas in each classroom.

3.4. FtFPI leading to deep learning

Having covered the first three categories we now turn to the fourth category: face-to-face promotive interactions leading to deep learning³ (see Appendix 4). Kutnick, Ota, and Berdondini (2008) reported that students in the classes that used the relational approach⁴ could lead to deep learning. However, the researchers concluded that the development of effective group work was dependent on key principles of relational development, the long-term commitment of teachers, and the ability of teachers and students to turn their classes into CL environments.

Tan, Sharan, and Lee (2007) reported that GIM (Group Investigation Method) provided better social relationships, fostered friendships, and learned more about cooperation. However, GIM did not have a great effect on students' achievement and motivation because the students had insufficient time to adjust to it.

Stamovlasis, Dimos, and Tsaparlis (2006) pointed to the importance of students' preparation for the interaction process and teachers' contribution in managing group work as important factor for enhancing the group's effectiveness. Similarly, Asha and Al Hawi (2016) found the necessity to prepare students in the decision-making process due to its impact on their mathematics achievements.

Lehraus (2015) found that young students could display high levels of on-task work, paired support and enhancement of students' involvement in constructive dialogues during CL writing tasks. Similarly, Ahlquist (2015) used the storyline approach in CL for an ESL class, and showed that students promote learning in English within a narrative framework while students forged a strong and supportive bond within a well-functioning cooperative group.

Lafont, Rivière, Darnis, and Legrain (2017) explored two key areas for effective students' interaction within CL: the role of tutor training, and individual characteristics of participants in terms of dyads. The researchers highlighted the role of interaction between peers in knowledge acquisition and motor skills learning. The findings showed that the effects of training for functional interactions and the conditions for matching tutor/tutored dyads were important prerequisites for successful CL in physical education.

3.5. Teachers' influence on students' FtFPI

The fifth and final category is the teachers' influence on students' face-to-face promotive interactions for successful CL (see Appendix 5). This section describes the teacher's role and influence as one of many pivotal factors for successful CL settings.

Chiu (2004) reported that the teachers' evaluation and adaption of TIs to students' needs allowed the students to use their own ideas in solving problems. They then asked for less help from the teachers. Gillies (2016) pointed out that when teachers not only listened to their students attentively, but at same time challenged and facilitated their understanding, their students were more engaged in their ideas and reasoning. Furthermore, to support students' CL group work, Kaendler, Wiedmann, Rummel, and Spada (2015) showed three implementation phases of CL. The first was the pre-active phase of CL that included the teachers' competencies in planning student interaction. Second was the interactive phase, which referred to how the teachers monitored, supported, and consolidated the students' interaction. Finally, the post-active phase referred to the teachers' self-reflection and reflection on the implementation of CL.

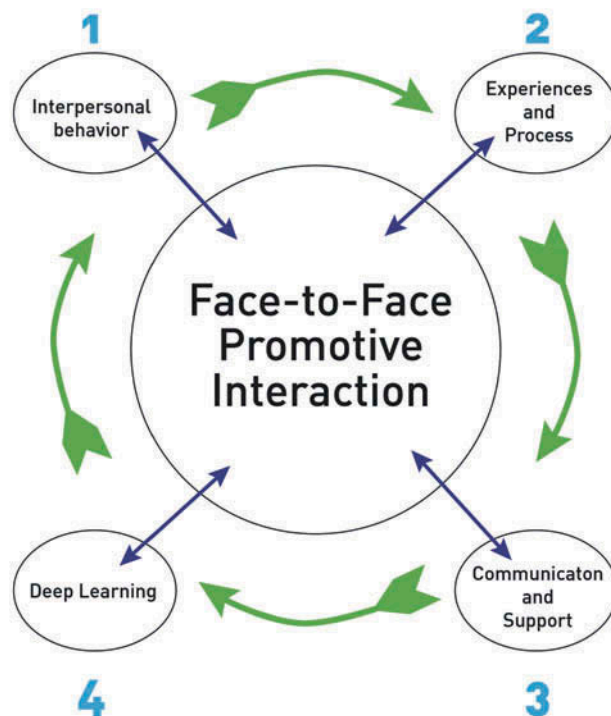
Jolliffe (2011) reported on the importance of having a dedicated school staff and common support across schools for successful CL. However, this researcher concluded that the level of teachers' support, such as coaching and mentoring skills, was a prerequisite for successful implementation of CL. Similarly, Dzaferagić-Franca and Tomić (2012) found out that the teachers need more support from professionals for better implementation of CL, even though 93% of the students were very responsive to the CL strategy in the lower primary school grades. Furthermore, Buchs, Filippou, Pulfrey, and Volpé (2017) found that teachers did not feel that CL was very easy to implement; more than 40% of the respondents only used it occasionally and only 33% used it regularly or often. However, the most challenging parts for them were embedding CL in the curriculum and finding the necessary time for CL and for assessing the students when using CL. Ultimately, Hayek, Toma, Guidotti, Oberlé, and Butera (2017) pointed out that environmental factors such as grades may influence the quality of the students' interaction with respect to successful CL.

4. Discussion

The aim of the present review has been to answer the following question: What FtFPI factors lead to successful CL in small groups? Examining the findings from studies of small CL group contexts, we organized them into the five interrelated categories that will also be used as the unit of analysis. The first four categories of engagement in small CL groups may be seen as interactive and cyclical (see Figure 1) as they may have reciprocal impact on each other. The fifth category, teachers' influence on students' FtFPI, has external influence⁵ on this cyclic process and as such, it is not visible in this process.

Starting with the first category, interpersonal behavior, in nine of the studies (see Appendix 1) helping behaviors were emphasized as the core element in students' cooperative interactions in the CL groups. Three studies reveal important characteristics of helping behaviors, such as

Figure 1. Key factors of students' FtFPI in a small CL group context.



responsiveness to others, giving more task-related help (Gillies & Ashman, 1995), promotion of each other's understanding in task-related help (Gillies & Ashman, 1998), willingness to seek help, and students' persistence in asking for help (Webb et al., 2002). One study shows that students' helping behaviors may provide more elaborate help that is both solicited and unsolicited if students are more involved within open-discovery-based tasks (Gillies, 2003a). However, while students' interpersonal behavior is an initial factor in FtFPI for successful co-learning (Johnson & Johnson, 1999), Magnessio and Davis (2010) claim that the student's self-awareness is a pivotal factor for having a successful CL experience.

In the second category, five studies (see Appendix 2) acknowledge the importance of students' exposure to CL experiences and the CL process (see Figure 1). These two factors are interconnected in terms of students' awareness of their active participation and familiarity with how to cooperate with each other during the FtFPI process (Genç, 2016; Oortwijn et al., 2008; Otienoh, 2015). Otherwise, those students who might have less experience in CL group work often find it challenging to develop stable and working relationships with their peers (Genç, 2016; Tan et al., 2007). Mueller and Fleming (2001) state that students need time to develop an understanding of how to work together. Bearing this in mind, students have different experiences of interacting cooperatively to increase acceptance, and of becoming aware of the effect they have on others (Mary, 2014). Earlier studies have found that students' positive experiences of FtFPI require the instructional process that is used for small CL groups (Lou et al., 1996).

In the third category, several of the reviewed studies focus on how communication is used to manage students' support and success in CL (see Appendix 3). Golub and Buchs (2014) state that students' preparations for their cooperation lead to more constructive interactions. The power of feedback increases peer monitoring (Ross, 1995) and improves the communicative process between the students as they depend on each other's support (Quebec-Fuentes, 2013). Moreover, questioning, providing feedback, and modeling are found to be the most common forms of support that make students' CL in FtFPI successful (Gnadinger, 2008). This is in line with what Black and William (1998)

say about the frequent use of feedback during students' FtFPI, where they point out that it helps students to understand what they need to do to complete a task.

The fourth category (see Appendix 4) includes five effect studies of CL group work, which emphasize the impact of students' FtFPI interactions on their individual and group achievements. Two qualitative studies (Ahlquist, 2015) in English and (Lehraus, 2015) in composition provide deep understandings of meaningful contexts for CL. While FtFPI may support problem solving, the findings from one study show that not all students are able to move towards higher achievement levels (Tan et al., 2007). The outcome of deep learning can be more than just achievement scores on tests, but might also include cooperative skills and cooperative aspects necessary for interacting in FtFPI. For instance, Tan et al. (2007) find that students achieve deeper understanding of the topic, promote better relations, and have deeper learning about cooperation, even if the achievement levels are no better in CL groups in comparison to other teaching methods. However, one major impediment to students' academic achievement is that the teachers and students were not sufficiently prepared and accustomed to the implementation of CL in regard to group investigation method (Tan et al., 2007). Kutnick et al. (2008) and Stamovlasis et al. (2006) recognize the need to prepare students to increase their contribution to the procedural nature of the assigned tasks so they can attain a higher degree of learning.

Finally, the fifth category, teachers' influence on successful CL in FtFPI will only be achieved when teachers create good conditions, foster, and monitor the interaction between students in small CL groups (Kaendler et al., 2015). All seven studies (see Appendix 5) have underlined the necessity of preparing teachers for cooperation: supporting, monitoring, and assessing students' FtFPI can improve the successful CL. However, it has also been found that those teachers who believe that students construct their learning in social interactions use CL more often (Buchs et al., 2017), and they support the promotion of FtFPI among the students (Baines et al., 2015).

4.1. Limitations and future research

This research review suggests that students who have been instructed in positive interpersonal behaviors, in the rules governing cooperation, and in the relational approach to CL are able to learn successfully within classrooms geared towards collaborative and academic learning goals. The review also demonstrates that assessment of CL from the students' perspective can be a good way of improving the CL (Mary, 2014; Oortwijn et al., 2008; Otienoh, 2015). For this reason, experimental tests, questionnaires, and observation methods were commonly used in the reviewed research for data collection. However, in these cases the students' voices could not provide deeper insights into the FtFPI process in a small CL group context when it comes to the individual students' perspective. More research is needed in order to explore the students' experiences and mechanisms, such as using FtFPI and scaffolding tools in cooperative situations when working on cooperative tasks (Zamani, 2016).

The studies reviewed suggest that the teacher role is challenged when implementing CL. Hence, much of the research suggests that the best support for long-term success in CL implementation is in teacher education, where teachers learn through experiencing CL and through post-training phase support (Jolliffe, 2011, 2015; Kaendler et al., 2015). Accordingly, the teacher factor is in line with earlier research where Battistich et al. (1993) found that the effects of CL depend on the quality of the group interaction and teacher's influence. Since this review included multiple international studies, the five elements developed by Johnson and Johnson (1999) were used as a standard for all the included studies. In many of the reviewed studies, the researchers did not explicitly use the term of FtFPI, but students' promotive interaction indicated it. When the research is only on CL in classroom settings, the research is limited when it comes to understanding the influence of out-of-classroom CL factors, such as study visits or project work in natural educational settings.

Since the five presented categories (see Figure 1) of FtFPI have the potential to increase the students' success in CL, this review recommends them as key factors that affect successful CL. Thus,

this review is a step further towards bridging the gap between the beneficial promise of CL and its implementation in terms of students' FtFPI (Jolliffe, 2011, 2015; Kaendler et al., 2015; Sharan, 2010).

5. Conclusion

Due to the complex relationships between cooperating students, the present review aims to identify factors of students' FtFPI that may lead to successful CL in small groups in accordance with the research question: "Which FtFPI factors lead to successful CL in small groups?" Reviewing 34 peer-reviewed articles, the findings illustrate such key factors as students' interpersonal behavior, experiences, communication and support, and teachers' influence, all of which underpin the FtFPI process and in turn can lead to deep learning. The review suggests that both teachers and students must prepare well in order to achieve successful CL implementation with respect to the complex issue of FtFPI in CL. They also need to be prepared if FtFPI within peer relations is to be maintained, systematic development, support, and a strong effort are required (Shachar & Sharan, 1995). More empirical research is needed to understand the complexity of students' FtFPI and to investigate the development of FtFPI based on students' and teachers' experiences in small CL groups.

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Notes

1. According to Cohen (1994), small CL groups encompass between two to four students in which they are participating and contributing to carry out their joint task without direct supervision of their teacher.
2. CL refers to more intentionally designed group activities and structured interaction, such as interdependence of group members and FtFPI whereas COL is less structured in terms of students' interdependence and FtFPI while they are working together towards their group goals (Johnson & Johnson, 2002; Slavin, 2015).
3. For the purpose of the present review, deep learning refers to both an individual and social process that may enhance learning and problem solving in small CL groups (Millis, 2014) if students' group interactions are based on helping each other, seeking new ideas, and thinking together (Millis, 2014; Stamovlasis et al., 2006).
4. The relational approach developed for this study addressed such communicative skills as listening,

explaining, and sharing ideas, having close relationships involving trust and support (Gillies, 2003a).

5. The teacher is seen as a factor that takes part in students' learning activities outside of small CL group work by monitoring, supporting, and consolidating students' interactions, and finally reflecting on them (Kaendler et al., 2015).
6. Publication Across Subjects in Education.
7. Pedagogical resources and learning processes in kindergarten and school.
8. In French: Interactions Sociale et Acquisition.

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Appendices

Appendix 1. Summary of studies of interpersonal behavioral factors

Author/Year	Purpose of the study	Methodology	Main findings
Gillies and Ashman (1995)	To compare the effects on behavioral interactions and achievements of CL in groups of students trained and untrained in cooperation	Quantitative study. 192 grade 6 students in eight schools were video-observed, Australia	The students in the trained groups engaged in more cooperative behavior and less non-cooperative behavior, provided more explanations to assist others, and achieved higher learning outcomes than their peers in the untrained groups
Gillies and Ashman (1998)	To determine the effect of cooperative group work on children's helping behaviors, interactions and learning outcomes in structured and unstructured groups	Quantitative study. Questionnaire and group observation with 360 grade 1 and 3 students in eleven schools, Australia	The children in the structured groups exhibited more cooperative behaviors and less non-cooperative behaviors than their peers in the unstructured groups
Gillies (2003a)	To synthesize the effects of 5 studies of small group learning on students' behaviors, interactions, and learning	Quantitative studies. Videotape of and questionnaire given to age-peers ranging from grades 1 to 8, Australia	The students in the structured groups (i.e. task was interdependence and the students had been trained to cooperate) had more time to work together, they exhibited more cooperative behavior and less non-cooperative behavior
Gillies (2003b)	To investigate and compare behaviors, interactions, and perceptions of students in structured and unstructured CL groups	Quantitative study. Videotape of and questionnaire given to 220 students in six junior high schools, Australia	The students in structured CL groups were more involved with each other, felt committed to the group, and developed a sense of group cohesion. They provided more help to each other
Webb et al. (2002)	To explore the nature of helping behavior within peer-directed small groups that may be most effective for students who have difficulties with the material	Quantitative study. Training, testing, and assessing students' group-work skills with six classes in grade 7, USA	Conditions for effective assistance in small groups are based on raising students' awareness of their responsibilities for other students (help givers and help seekers) and teachers' responsibilities in designing instruction and practice activities that enable the participants to practice these responsibilities
Magnesio and Davis (2010)	To examine how a structural approach to CL influences the social skills of 4 th graders and what influence student reflections have on social interactions	Action research-pre and post- students' preparation using sociograms, students' reflection, and tally charts with grade 4 classes, USA	Improvement on both individual behavior and more student interactions
Yoruk, 2016	To investigate students' ideas on the cooperative learning method (CLM) and its effect on cognitive and affective attributes	Quantitative study. Survey with 20 students, Turkey	CLM increased the students' social behavior, self-confidence and awareness of the learning environment

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Author/Year	Purpose of the study	Methodology	Main findings
Gillies (2006)	To determine teachers' and students' helpful and supportive interaction	Comparative study. Observation and audiotape with 26 teachers and 303 students in grades 8–10 from 4 high schools, Australia	Teachers who used more facilitative learning behaviors influenced the students' modeling in many of their group interactions (engaging in more positive helping behaviors with their peers)
Gillies (2002)	To investigate the long-term effects of training in small-group and interpersonal behaviors	Quantitative study. Video observation of 92 third grade students from nine schools, Australia	Students who had been trained to cooperate and help each other were able to demonstrate these behaviors during small group work two years after their initial training

Appendix 2. Summary of studies within students' experiences and the FtFPI process

Author/Year	Purpose of the study	Methodology	Main findings
Otienoh (2015)	To implement group work and pair work to improve teaching and learning in large classes by creating interaction opportunities for learners	Mixed-methods study. Interviews and observations of four social-studies teachers and groups of six students from each of the teachers' classes, Kenya	The study found that systematic incorporation of basic elements of CL in group work made it more viable in creating and retention of interaction opportunities for learners in large classes. The teachers felt that group work created an inclusive classroom
Genç (2016)	To investigate the effectiveness of CL on students' achievement in science lessons, examining the five dimensions of CL entitled "positive interdependence", "individual responsibility", "face-to-face promotive interaction", "small group skills" and "group process"	Quantitative study. Solomon's four-group model with 135 sixth grade students in experimental and control groups, Turkey	CL activities in the experimental group meaningfully increased the students' achievements. There was a meaningful difference between the two groups in terms of FtFPI
Oortwijn et al. (2008)	To investigate popularity and perceive non-cooperativeness in multi-ethnic elementary schools	Quantitative study. Social-status questionnaire with 94 pupils in fifth grade, from five elementary schools divided into 26 teams, Netherlands	Structured cooperative learning (SCL) activities increased the popularity of immigrant pupils and decreased differences in perceived non-cooperativeness between immigrant and non-immigrant pupils
Mary (2014)	To investigate the role of co-operative games and circle time activities in fostering positive peer relations	Case study. Individual and focus-group interviews with 40 primary students, France	Increased acceptance towards peers, with students becoming aware of their own behavior and the effect it had on others
Mueller and Fleming (2001)	To determine students' experience and learning over five weeks of learning together	Ethnographic case study-interviews, self-evaluations and drawings with 29 grade 6 and grade 7 students across 11 group-work sessions, Canada	The students required periods of unstructured time to organize themselves and to learn how to work together towards a mutual goal

Appendix 3. Summary of studies of students' communication and support

Author/Year	Purpose of the study	Methodology	Main findings
Golub and Buchs (2014)	To demonstrate that a short preparation period related to social support and cooperative rules increases students' constructive interactions	Intervention study. Videotape of 32 students in grade 6, Switzerland	A short preparation period to help students to cooperate elicited more constructive interactions among the students
Gnadinger (2008)	To examine how elementary-school students provide scaffolding to one another during cooperative classroom activities	Case study. Videotape, interviews and field notes with students in grade 2 and 3, USA	Peers provided scaffolding for one another in various ways while modeling was found to be the most popular method of scaffolding used by the peers
Quebec-Fuentes (2013)	How teachers can interact with their students while they are working in groups to encourage and enhance student-to-student communication	Action research study. Videotape of 9th and 10th grade students in four groups of four students and one teacher, USA	By using the process of help interventions, the teacher promoted discourse between the students both when the teacher was present and not present with a group. Students were consistently asking questions of their peers, responding to these questions, listening to the explanations and critically evaluating each other's work
Ross (1995)	To assess the effects of a feedback strategy on the frequency and quality of student's attempts to help one another learn	Mixed methods. Audio and video-recordings with 18 mathematics students in grade 7, divided into five small CL groups, Canada	Results show that assessment increased the frequency and quality of help seeking and help giving and improved students' attitudes in asking for help
Webb and Mastergeorge (2003)	To explore how students' helping behavior within small groups influences student learning, especially for students who have difficulty with the material	Summary of several studies. Training, testing and assessment of students' group work skills in 7th grade so that the students had opportunities to help each other in learning mathematics collaboratively, USA	The study identifies that effective help seekers ask precise questions, persist in seeking help and apply the explanations received. In turn, help givers provide detailed explanations of the material as well as opportunities for help recipients to apply the help received and monitor students' understanding
Kershner et al. (2014)	To explore students' dialogues in managing group work within collaborative science activities using an interactive whiteboard	The qualitative study. Videotape and group interviews with 12 small groups of 8-10-year-olds and teacher discussion, England	Results revealed that students who talk about the need to wait and be patient during group work fall into the following categories: technical aspects, achievement and personal and social considerations. Group achievement in learning is based on rules such as how to talk together and work collaboratively

Appendix 4. Summary of studies within FtFPI leading to deep learning

Author/Year	Purpose of the study	Methodology	Main findings
Kutnick et al. (2008)	To assess whether a classroom-based and teacher-led relational approach to the development of group work amongst young children in primary schools enhances the quality of peer interaction learning and the motivation to work with others compared to the control group	Quasi-experimental study. 980 students from 17 classes of experimental (eight in grade 1 and nine in grade 2) and 21 control groups (ten in grade 1 and 11 in grade 2) assessed and compared for attainment (reading and mathematics), motivation for group work and behavioral/communicative actions, the UK	Students in experimental classes improved more than children in control classes with respect to academic attainment and motivation to work with others, and showed high levels of communicative interactions with partners
Tan et al. (2007)	To evaluate the effects of the group investigation method (GIM) of CL versus effects of the traditional whole-class method in terms of academic achievement, students' intrinsic motivation to learn, and perceptions of group investigation	Experimental study. 241 students in grade 7 were taught in either the whole-class method (103 students) or the GIM approach (138 students), and there were three geography teachers, Singapore	Findings show that GIM in CL was not more effective than the whole-class method
Stamovlasis et al. (2006)	To explore the effectiveness of a CL approach where students discussed and elaborated on the concepts of physics on problem solving tasks	Effect study. Audiotape with 64 students in grade 10 distributed across 19 groups of three or four. The study consisted of three sessions, 45 minutes each, analyzing the effectiveness of the achievement in groups correlated with student's participation, and group activity through the "pre-test", "group-test" and "post-test" stages, Greece	Findings show the advantage of CL in physics learning in terms of the students' interactions, information exchange, roles as learners, and learning facilitator roles. Students showed "dramatic" cognitive gains within problem-solving tasks immediately after CL, but some students failed to retain them (post-test phase)
Asha and Al Hawi (2016)	To investigate the effect of CL on developing students' decision-making skills and their academic achievement	Experimental study. Mathematics teachers' observations and questionnaire given to two groups of 46 students in grade 6 divided between an experimental group that was taught using the CL strategy and a control group, Jordan	The findings from this study revealed the positive impact of interaction and cooperation among students on enhancing their decision-making skills in order to achieve their common goals. There were statistically significant differences between the experimental and control groups

(Continued)

Author/Year	Purpose of the study	Methodology	Main findings
Lehraus (2015)	To explore how cooperative skills can be integrated into teamwork learning tasks in the area of writing (composition) and to explore peer interactions of young pupils engaged in such learning situations	Intervention study. Videotaped two classes (grade 2) of primary schools while integrating both cognitive and cooperative skills into writing tasks based in French, Switzerland	Young pupils were able to work cooperatively in pairs on writing tasks without the teacher's help or support
Ahlquist (2015)	To explore a project based on the syllabus for English using Storyline approach with students working in small groups in order to promote learning of English as a second language	Qualitative study. Observation, notes, questionnaire, interviews, copies of the students' texts and video recordings with two teachers and 32 students (11–13-year-olds), Sweden	Findings showed that this approach proves to be highly motivational in engaging students in language learning and provided a meaningful context for speaking, reading and writing in a second language
Lafont et al. (2017)	To provide an overview of several studies on how interactions between students in cooperative group structures influence content learning in physical education	ISA ⁸ research group. Findings included quantitative data used to test the effectiveness of various interactive procedures and qualitative analyses of verbal protocols of interactive dynamics in CL and peer-assisted learning (PAL)	The studies have demonstrated the positive effects of CL on the relationships between peers, between students and teachers, and the content to be learned

Appendix 5. Summary of studies of teachers' influence on students' FtF

Author/Year	Purpose of the study	Methodology	Main findings
Chiu (2004)	To test a model of teacher interventions (TIs) within CL to examine how they affect students' subsequent time on-task (TOT) and problem solving	Quantitative study. 220 students from grade 6 to 9 classes (55 groups) and two teachers. Videotaped lessons are transcribed and analyzed using regression analyses, t-tests and Wilcoxon tests, Hong Kong	Results showed that teachers initiated most TIs during CL and typically did so when students were off-task or showed little progress
Kaendler et al. (2015)	To describe teacher competencies for implementing CL in the classroom	Review of summarized pivotal empirical research findings from experimental studies on CL conducted in primary and secondary schools	The focus on what a teacher can do to foster student interaction shows that effectiveness of CL largely depends on the quality of student interaction
Gillies (2016)	To examine the types of teachers' prompts and mediating behavior used to promote thinking, problem solving, and reasoning in students' interaction	Mixed-method videotape with three grade 7 teachers and 17 groups of students from their classes who were trained to use a dialogic approach, Australia	Teachers need to be instructed in how to engage students to promote their activity in interactions through dialogic discussions, while the teacher's role is to model and facilitate these dialogic exchanges
Jolliffe (2011)	To examine the gap between the potential of CL and its effective use in the classroom	Reviewing empirical findings from a case study of a network learning community (NLC) in two secondary and ten primary schools over five years, England	CL requires a sustained implementation where teachers work together to overcome its complexity, particularly when they are supported by a professional learning community of facilitators or in-house experts
Dzaferagić-Franca and Tomić (2012)	To examine opinions of teachers regarding the applications of CL in lower elementary school grades	Survey. 204 teachers (1-5 grades) in Tuzla Canton, Bosnia and Herzegovina	CL is a frequently applied strategy in school subjects such as my environment, physical education and mathematics
Buchs et al. (2017)	To examine teachers' opinions about their challenges in CL implementation	Survey study. 67 schools with 207 teachers (116 participants in lower primary) and (109 in upper primary schools) from the canton of Geneva	Teachers need support in continuous development to surpass challenges arising from CL implementation
Hayek et al. (2017)	To examine whether grades elicit disruptive interactions and reduce performance in a cooperative game task	Experimental study. 132 students from grade 5 (42 groups randomly structured into two experimental conditions: 20 in the neutral priming condition and 22 in the grades priming condition) from two primary schools, Switzerland	The findings show that the presence of grades, compared to the absence of grades in CL, impeded the students' cooperation in the form of negative dominant behaviors, which undermined the group performance and reduced the possibilities to achieve successful student learning



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