

**First-year Implementation Effects of a Staff Development Program
on Cooperative Learning**

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ABSTRACT

In this study, the first year implementation effects of a staff development program on cooperative learning for Dutch elementary school teachers were studied. A pretest-posttest control group design was used to investigate program effects on teachers' instructional behaviors. Based on observations of teacher behavior during a cooperative lesson, a statistically significant treatment effect was found for the following instructional cooperative behaviors: structuring positive interdependence, individual accountability, social skills, and evaluation of the group processing. Training effects were also found for the use of cooperative activities in the direct instruction model and for activating pupils' prior knowledge of social skills.

First-year Implementation Effects of a Staff Development Program on Cooperative Learning

Promotion of cooperative learning has been high on the educational reforms and restructuring agendas, for the last few decades. Cooperative learning (CL) involves pupils working together to accomplish shared learning goals. Facilitating active learning, involving teaching for understanding, the use of teaching methods to develop critical thinking and problem solving, and the development of learning communities at school are central principles for the educational reforms in the OECD countries (Stern & Huber, 1997; Adviesraad Onderwijs, 1994). The emphasis on active learning is supported by current cognitive conceptions of both learning and instruction (Shuell, 1996). CL structures and approaches are seen as valuable instructional strategies for strengthening pupils' capacity for active learning at school and for the promotion of pupils' cognitive and social development.

According to Johnson, Johnson, and Stanne (2000) and Slavin (1995), there are many reasons for CL to enter the mainstream of educational practice. First, CL is solidly based on a variety of theoretical perspectives. Slavin (1996) distinguished four major theoretical perspectives in research on CL: motivational perspectives, social cohesion perspectives, cognitive development perspectives (see De Lisi & Golbeck, 1999, and Hogan & Tudge, 1999 for respectively the Piagetian and Vygotskian approach), and cognitive elaboration perspectives (see also King, 1999; Webb & Farivar, 1999).

Second, numerous studies have demonstrated the effectiveness of CL methods for the promotion of pupil learning and social relations relative to more traditional whole-class methods of learning (Cohen, 1994a; Johnson et al., 2000; Sharan, 1999; Slavin, 1995, 1996). There are numerous research studies validating the effectiveness of cooperative over competitive and individualistic efforts, showing a variety of diverse positive outcomes, such as achievement, higher-level reasoning, time-on-task, transfer of learning, motivation, social development, valuing ethnic differences, and self-esteem.

Third, a variety of CL methods are available for teacher use, ranging from very concrete and prescribed to very conceptual and flexible. In assessing the effectiveness of specific CL methods, a number of "researcher-developers" have developed CL procedures, conducted programs of research and evaluation of their methods, and then involved themselves in teacher-training programs. Well-known methods of CL are Complex Instruction (Cohen, 1994b), Learning Together (Johnson & Johnson, 1994), Student Teams-Achievement

Divisions and Teams-Games-Tournaments (Slavin, 1995), Cooperative Structures (Kagan, 1994), and Jigsaw (Aronson, 1978).

Notwithstanding the theory-based nature of CL, the substantial body of research demonstrating the positive effects of CL, the availability of research-based frameworks for CL, and the reform agendas incorporating CL as a valuable instructional strategy, CL methods are not commonly used in the OECD-countries (Panitz, 2000; Stern & Huber, 1997), where learning is largely considered an individualistic enterprise with whole-class instruction as the dominant form of teaching. The emphasis on individualistic and whole-class instruction goes hand in hand with a lack of teacher training in CL methods. Teachers are not trained to facilitate learning in small groups and are therefore not familiar with what CL involves. For this reason a school improvement program for CL was developed¹. This program is based on a theoretical background rooted in the literature on staff development, teachers' professional development, implementation of educational change, and cooperative learning. The purpose of this study is to describe some of the effects of this staff development program after one year of implementation, with a special emphasis on the cooperative instructional behaviors of the teachers.

Essential Elements of Cooperative Learning

In order for a lesson to be cooperative, five basic elements are essential (Johnson & Johnson, 1994) and need to be included: (1) positive interdependence (the perception of group members that they must work together to accomplish a common goal), (2) individual accountability (group members are held responsible for their contribution to goal achievement), (3) face-to-face interaction (group members meet face-to-face to promote one another's work), (4) the development of social or small-group skills (the interpersonal skills needed to work in a group), and (5) group processing (group reflection on the collaborative effort and decisions on how to improve effectiveness).

In a comprehensive review of the effects of CL, Slavin (1995) observed that CL is most effective when the groups are recognized or rewarded on the basis of the individual learning of the members. Group goals and individual accountability stimulate pupils to help each other and encourage maximum effort. Studies of CL methods incorporating group goals and

¹ The program was developed by the Department of Educational Sciences of the University of Nijmegen in collaboration with the national Christian Pedagogical Study Centre, the regional Educational Service Centres of Arnhem and Nijmegen, and the Educational Faculty of the Teacher Education College Arnhem-Nijmegen.

individual accountability show a much higher median effect size than other CL methods. The median effect size across 52 studies including group goals and individual accountability was +0.32 as opposed to only +0.07 across 25 studies not including group goals and individual accountability.

Another characteristic of CL related to its effectiveness is the heterogeneity of the group members (Bennett & Dunne, 1992; Johnson & Johnson, 1994; Slavin, 1995). Research has shown effective CL groups to include high-, medium- and low-ability pupils working together. Low- and medium-ability pupils clearly benefit from working cooperatively with high-ability peers. There is also evidence that the high-ability pupils are better off academically when cooperating with medium- and low-ability peers as opposed to working alone. Working in heterogeneous groups may benefit low-ability pupils by allowing them to observe the strategies of high-ability pupils. Similarly, high-ability pupils may learn new strategies by teaching other pupils in the group.

CL groups require pupils to learn academic subject matter (taskwork) and the interpersonal and small-group skills necessary to function as part of a team (teamwork). If pupils do not learn teamwork skills, they cannot complete taskwork. Consequently, in planning a cooperative activity, a teacher needs to consider two goals: a cognitive or academic objective for taskwork (e.g., reviewing and practicing skills, applying computational or algorithmic procedures, development of higher order thinking) and a social skills objective for teamwork (e.g., encouraging each other, asking for and giving help, monitoring voice level, checking for understanding).

According to Slavin (1995), CL methods for mastering academic content at school rarely replace direct instruction by the teacher, but rather replace individual seatwork, individual study, and individual drill. Therefore, cooperative activities should generally be linked with some form of direct instruction. However, the direct instruction by the teacher should be followed by small-group practice for the pupils to work together to master the lesson's content and skills and not by individual or independent practice (working alone, as in the direct instruction model; see Rosenshine & Stevens, 1986). Research on school improvement programs developed under the supervision of Slavin – such as Team Assisted Individualization (TAI), Cooperative Integrated Reading and Composition (CIRC), Success for All), combining the use of direct instruction with CL – showed that these programs more successfully promote pupil achievement, as compared with traditional methods (Slavin, Madden, Dolan, & Wasik, 1996). Instruction appears to be an important prerequisite for cooperation.

When the pupils work in small groups the teacher's role is to monitor their interactions and intervene when necessary to help them to learn and to communicate more skillfully (Johnson & Johnson, 1994). Teachers observe the interactions of group members to assess their academic progress and their use of the appropriate social skills. By carefully listening to pupils' mutual explanations, teachers can determine what the pupils do and do not understand.

Recent (social) constructivistic learning theories consider the active use of prior knowledge to be a key strategy for meaningful learning (Shuell, 1996). Prior knowledge can serve as a starting point for future learning. When teachers link new information to the pupils' prior knowledge, they can activate their interest and curiosity, and infuse instruction with a sense of purpose. In the context of CL, preparation for learning not only refers to activating relevant academic knowledge but also activating the social skills needed to cooperate successfully.

Concerns have been expressed about the successful use of the essential elements of CL in real classroom practice. Studies by Antil, Jenkins, Wayne, and Vadasy (1998) and by Veenman, Kenter, and Post (2000) showed that teachers' use of CL is not always consistent with what the scholarly literature recommends. Teachers were rarely found to set group goals, to hold pupils individually accountable for their contribution to group work, or to teach the social-interaction, communication, and problem-solving skills necessary for effective cooperative work. More specifically, the basic elements of positive interdependence, individual accountability, interpersonal and small-group skills, and group processing received little attention from teachers. Studies about the way teachers actually use CL in the classroom suggest that attention needs to be paid to training the essential features of CL.

Implementing CL

Studies concerning the adoption and dissemination of CL methods in elementary and secondary schools show the implementation of CL methods in the classroom to be a complex and difficult process. Successful implementation of CL depends largely on the teachers' understanding of what CL really is and on their skills to use CL methods insightfully and appropriately.

In our school improvement program, cooperative learning is used as a philosophical and practical approach for changing classroom processes to provide pupils with more active learning experiences, and to create a more supportive social environment for pupils and teachers (cf. Stevens & Slavin, 1995). The main elements of the program for the first year of

implementation were staff development and coaching of teachers. These two elements and the theoretical and research rationale behind them will be briefly described.

Staff development aims at improving teachers' expertise in using CL in their classrooms constructively, appropriately, and in an integrated way with individualistic forms of learning. Johnson and Johnson (1998) argued that effective staff development incorporates three stages to achieve long-term implementation of CL: (1) *pre-training*: preparing for the training by creating the conditions for successful staff development in CL; (2) *training*: conducting the staff development sessions in ways that ensure teachers to master the conceptual framework and actual procedures for using CL; and (3) *post-training*: providing support for transfer of what is learned in the sessions to the actual use of CL in the classroom and for long-term maintenance of the use of CL in order to institutionalize CL as a standard instructional practice in the organization of the school.

During the pre-training stage of staff development, schools interested in CL were informed about the conditions for participation. Because CL touches the heart of the teaching-learning process (the core function of the school), CL has to fit into the learning conceptions of the participating schools. Furthermore, participating schools should be prepared not to consider participation in other innovative projects for a period of two to three years and to concentrate their energies on learning to use CL methods. Studies on educational change and innovation suggest that changing instructional practices takes years, not days (Fullan, 1991). According to Johnson and Johnson (1998), two to three years may be the average amount of time required to become a skilled user of CL procedures. Finally, a participating school should be prepared to build a cooperative school culture, which supports the change process, fosters continuous learning about CL, and leads to its school-broad implementation.

During the training stage of staff development, teachers in the participating schools were given training and assistance to use CL methods in their classrooms. To enable teachers to master the conceptual framework and actual procedures for CL, teachers were trained during two consecutive years. The staff development sessions or workshops were based on two approaches prominent in the literature, namely Johnson and Johnson's (1994) "Learning Together" approach and Kagan's (1994) "Structural Approach". Johnson and Johnson's five-element standard was used to classify group work as cooperative: positive interdependence, individual accountability, face-to-face interaction, the development of small-group skills, and group processing. Cooperative structures are the "building blocks" in Kagan's structural approach to CL. A cooperative learning structure is a content-free way of organizing social interactions in the classroom. The CL structures usually involve a number of steps with

proscribed behaviors for each step. The structural approach provides “discrete, bite-sized learning units for teachers” (Kagan & Kagan, 1998, p. 106). Compared with other approaches to CL, the structural approach is easier to implement because teachers can acquire the structures one-at-a-time. In Kagan and Kagan’s (1998) view, structures are the perfect starting point for teachers getting into CL.

During the post-training stage, attention was focused on support for transfer of the learned skills to actual classroom use of CL. Continuing support is important for long-term maintenance of the use of CL in order to institutionalize CL as a standard instructional practice in the organization of the school. In the first year of our program expert coaching was used to assist teachers to apply in their classrooms what they had learned in the workshops.

Coaching of teachers. Coaching as a form of in-class support can help teachers improve their instructional effectiveness by providing them with feedback on their functioning and stimulating them to be more reflective. The intent of coaching is to help teachers learn how to implement CL by giving technical support and assistance, providing companionship, and helping the teacher reach executive control through reflective feedback and discussion (Veenman & Denessen, in press). Coaching is an approach that has successfully produced higher implementation of innovative instructional practices and teachers’ collaborative interactions (Costa & Garmston, 1994; Joyce & Showers, 1995; Roelofs, Veenman, & Raemaekers, 1994).

Research Questions

The school improvement program comprises two years of implementation. The present study only addressed the effects of the first year; the second year of implementation was still in progress at the moment of writing this article. The main aim of the program was to guide the teachers in developing the instructional behaviors necessary to conduct a cooperative lesson. Through participation in six workshops and through coaching during one year, teachers were supposed to be capable of implementing the desired instructional behaviors.

The specific research question that guided the study for the first year of implementation was the following: Are teachers who participated in the staff development program on CL more able to implement the desired instructional cooperative behaviors than teachers who did not participate in the staff development program?

Method and Instrumentation

Participants

Seven elementary schools located in the east and south of The Netherlands participated in the study. In the selection of the schools, care was taken that the schools would be prepared to actively participate in the school improvement program. CL needed to fit into the learning conceptions of the school. The teachers should be interested in CL and should be prepared to implement CL in their classrooms. The principal had to be willing to create a leadership team and to participate with that team in two workshops on transformational leadership. All participating schools showed an interest in applying CL. Four of them were ready to start with the school improvement program in the fall of 1999. The other three agreed to participate as control group and would enter the program in the fall of 2001. Prior to the staff development program on CL, none of the teachers had received systematic exposure to or training in CL methods.

Participants were all 70 teachers (47 females, 23 males) of the seven schools (K1, K2, grades 1-6). The control schools (36 teachers) were similar to the experimental schools (34 teachers) with respect to locality, school size, school enrolment and interest in CL. Average class size was 27 in the treatment group and 24 in the control group. Both groups of teachers were similar with respect to gender, age, and teaching experience. The average age of the teachers was 39 years. They had on average 16 years of teaching experience. At pretest 70 teachers participated in the observational study. At posttest 65 teachers participated, five teachers were not available due to maternal leave or illness.

Treatment

Staff development sessions. To enable teachers to master the conceptual framework and actual procedures for using CL, teachers were trained during two consecutive years. In the first year of implementation (school year 1999-2000), the teachers received six half-days of training in the fundamentals of CL (followed by four half-days of training in the second year of implementation). The staff development sessions or workshops were distributed throughout the school year. The workshops focused on the nature of CL, the teacher's role in using CL, the basic elements that make cooperation work, research supporting the use of CL, assessing and evaluating group work, and effective interaction patterns in cooperative learning groups. Each workshop was structured as follows: opening, review of the main topics

of previous workshops, teambuilding activity, exchange of experiences with the use of CL methods in the classroom, presentation of new CL material, review and discussion of the CL methods used in the workshop, discussion about the application of the newly learned CL methods in the classroom, and conclusion. As stated before, the workshops were based on two approaches prominent in the literature, namely Johnson and Johnson's (1994) "Learning Together" approach and Kagan's (1994) "Structural Approach." During the workshops, the teachers worked together in cooperative groups using several CL structures as described by Kagan (1994). After explaining the rationale behind a CL structure and explaining the steps involved, the teachers were asked to work in heterogeneous CL groups and apply the relevant structure to directly experience its practical value. Nattiv, Winitzky, and Drickey (1991) referred to this method of learning-by-doing as the "immersion approach": CL is introduced during the first workshop and used as the only instructional strategy thereafter. Peer communication and learning were also attended to, because learning is mediated by the quality of the interactions in the CL group. One workshop was devoted to help-giving and help-receiving skills. Studies by Webb and Farivar (1994, 1999) showed that giving detailed elaborated explanations to others in the group is a strong predictor of achievement. Moreover, examples of interactions in cooperative learning groups were discussed, using the distinctions made by Mercer (1995) between disputational talk, cumulative talk, and exploratory talk.

The CL-workshops were conducted in a collaborative endeavor by staff members of the University of Nijmegen, the Christian Pedagogical Study Centre, the two Educational Service Centres, and the Educational Faculty of the regional teacher education college. Prior to the implementation of the workshops, the prospective trainers followed a pre-training (four half-day workshops). The six CL-workshops for teachers were conducted at the four experimental schools: at each school the training was provided by two trainers (team-teaching). One of the trainers was involved in the training at all four schools to guarantee uniform implementation of the program.

Each workshop lasted three hours. Following each workshop, the teachers were asked to put the things they had learned into practice. During each workshop, there was also an opportunity to discuss the teacher's own experiences with classroom implementation of CL. Background information on the topics considered in the workshops was provided in a manual distributed to each teacher after the workshop. An overview of the course is presented in Figure 1.

Insert Figure 1 about here

In designing the workshop activities, the training process was guided by the recommendations of Joyce and Showers (1995) for effective training: (1) presentation of theory, (2) modeling or demonstration, (3) practice, (4) structured feedback, and (5) coaching. The theoretical and practical principles of CL were presented in the manual. Modeling or demonstration of the cooperative teaching skills was done by the trainers and via the presentation of case studies. Practice was achieved by practicing with peers (role-playing) and by asking the teachers to try out the cooperative activities in their classrooms and to discuss their experiences at the next workshop. Expert coaches provided feedback and coaching.

Coaching of teachers. In the first year of implementation of the school improvement program, each teacher was involved in approximately four coaching sessions, which took place in the second half of the school year. Expert coaches (five external school counselors, one teacher educator, one school principal, one internal school counselor, five graduate students in educational sciences and one member of the training staff) took care of the coaching sessions. All coaches were trained in the consulting form of coaching and were familiar with the content of the staff development program on CL. Consulting by a coach was directed at supplementing the teachers' own initiative for self-improvement of their cooperative instructional skills, and at strengthening their instructional competence in implementing CL in their classrooms. Each coach was responsible for the coaching of two or three teachers. The coaching sessions consisted of a cycle of three steps: (1) pre-conference to determine a focus for instructional improvement and data collection, (2) classroom observation, and (3) post-conference. In the pre-conference, the teacher determines the learning goals and the objectives of the cooperative lesson. During classroom observation, the coach collects data on the cooperative instructional behaviors as discussed in the pre-conference. In the post-conference, the focus is on feedback and reflection.

Measures

Cooperative Learning Observational Checklist. During each classroom observation session (lasting 30 to 40 minutes), the observer took notes about the cooperative instructional

behavior of the teacher. Directly after each observed lesson, the observer used these notes to code how the teacher structured the cooperative lesson, using the Cooperative Learning Observational Checklist. This checklist contains 34 items from which 30 were used in the present analyses. These items assessed to what extent the teachers applied the desired cooperative instructional skills as discussed in the staff development program.

Prior to collecting the observational data, five observers went through a training program of about 40 hours. The training program involved the coding of cooperative lesson videotapes as well as the live coding of cooperative lessons at four elementary schools not involved in the study. To assess interobserver agreement, 13 lessons were observed live independently by two observers, at least once by each possible pair of observers. Looking at items the maximum disagreement between observers occurred in 3 of 13 lessons. This was the case for only three items. For more than half of the items agreement was perfect or only one disagreement occurred. It was concluded that all 34 items could adequately be observed. To explore possible problems with observers, for each of the 13 lessons percentage of agreement within a pair of observers was calculated over all items. Results ranged from 79% to 100% with an average of 91%, indicating that interobserver agreement was satisfying. Prior to post-testing, the observers followed 12-hours refreshment training. Interobserver agreement was again assessed on four lessons, and ranged from 93% to 100%.

The items of the checklist were reduced to a number of variables representing the theoretically distinguished cooperative instructional skills regarded as essential for CL. Thirteen items addressed the five basic elements regarded as essential for an activity to be judged as cooperative (Johnson & Johnson, 1994). Six of these items dealt with the extent to which teachers structured *positive interdependence* (requiring a yes/no response or a rating on a 3- or 5-point scale). Analyses revealed that the teachers hardly used reward dependence, between-group dependence, or task dependence. For this reason, analyses were restricted to the other three forms of interdependence, namely goal dependence (no group goal, partly, clearly), resource dependence (no sharing of resources, partly, explicitly), and role dependence (no roles, a role for one, two, or three pupils, all pupils their own role). Nonlinear principal component analysis (CatPCA from SPSS; Gifi, 1990) was used to create a summary variable, conceiving the data as ordinal ratings. The first dimension with high loadings for goal and resource dependence explained 56% of the variance at pretest and 61% at posttest. Role dependence also correlated reasonably high with the first dimension at posttest but rather low at pretest. Summary variables were created by using the scores of the teachers on the first

dimension, as computed by CatPCA (so-called object scores, which have the form of standard scores with a mean of 0 and a standard deviation equal to 1).

One item addressed the extent to which teachers structured *individual accountability*. The observer rated on a 5-point scale to what extent the teacher made it clear to the pupils that their contribution to the group product would be individually assessed.

Three items addressed the promotion of *face-to face interaction*, namely seat arrangements to promote interaction between pupils (3-point scale), having the necessary materials ready (5-point scale), and giving clear instructions so that pupils can start immediately with their cooperative task (5-point scale). For these items, most of the teachers got a maximum rating even at pretest; this was especially true for 'having the necessary materials ready' (90% with the maximum rating). Since these items hardly differentiated between teachers, we did not create a summary variable for face-to-face interaction.

Concerning *social skills*, three aspects of teacher behavior were observed, namely specifying the social skills objective of the lesson (not at all, vaguely, explicitly), paying attention to the teamwork skills the pupils needed during a lesson (a 5-point scale from not at all to extensively at the beginning of a lesson), and praising the way pupils worked together (not at all, sometimes, often). At posttest, all items had high loadings on the first dimension of the CatPCA solution, which explained 66% of the variance. At pretest, however, the degree of teacher praise of the cooperative skills of the pupils had only a low loading on the first dimension, which explained 50% of the variance. Summary variables were created by computing the scores of the teachers on the first dimension at each observation period.

Two items assessed the evaluation of cooperative activities (5-point item), namely *evaluation of the group process* (the teacher evaluates how effectively the pupils worked together), and *evaluation of the group product* (the teacher evaluates the group product required from the lesson). It was taken into account whether or not the teacher involved the pupils in the evaluation, resulting in the following categories for each item: no evaluation (1), a summary only (2), an evaluation without pupil participation (3), a short evaluation involving also the pupils (4), and an extensive evaluation involving also the pupils (5).

The role of the teacher during group work is to *monitor pupil cooperation* and to *intervene whenever necessary*. The monitoring of the group work was assessed by one 5-point item concerning the way a teacher observed and assessed the quality of cooperative efforts in the learning groups (teacher doesn't circulate, circulates without observing, circulates and observes now and then, circulates and observes regularly, circulates and observes continuously). *Intervening* in cooperative learning groups was addressed by three items. One

3-point item concerned whether or not the teacher intervened without necessity (frequently, sometimes, never). The other two items concerned necessary interventions due to organizational problems or due to problems with the cooperation in a group. The categories for these two items were (1) not applicable because there was no problem, (2) no intervention although intervention was needed, (3) when needed the teacher intervenes sometimes but not always, and (4) the teacher intervenes always when needed. Because of the categorical nature of these variables, Homals (Gifi, 1990) from SPSS was used to perform a homogeneity analysis to create summary variables. At pretest the two items on necessary interventions had high discrimination measures on the first dimension (49% of variance explained), but not the item on unnecessary intervention. At posttest all three items had relatively large discrimination measures on the first dimension (59% of variance explained). The Homals object scores on the first dimension were used to represent teacher intervention.

The staff development program also paid attention to *combining CL with the model of direct instruction*. Six items addressed whether a teacher did or did not combine a cooperative activity with one or more phases of the model of direct instruction (DI) during teaching (daily review, orientation, presentation, guided practice, independent learning, and reflection). When one of the phases was not observed, this was coded as not applicable. Because of the categorical nature of the variables, Homals was used to explore the clustering of the variables and to examine the differences between the two groups of teachers. The clustering of the variables differed considerably for pre- and posttest. At pretest, daily review and orientation showed high discrimination measures for both dimensions. Presentation and guided practice discriminated moderately between the teachers, but only along the first dimension, whereas independent practice discriminated moderately along the second dimension. Reflection rarely occurred at pretest. At posttest, independent practice and reflection had the highest discrimination measures and determined the first dimension, whereas guided practice dominated the second dimension, with moderate discrimination measures for reflection and daily review. Presentation and orientation had only moderate discrimination measures along the first dimension.

Two items dealt with the activation of prior knowledge. Concerning cooperative learning a distinction is made between the activation of pupils' *prior academic knowledge* (the activation of academic knowledge relevant to the topic of the lesson) and pupils' *prior knowledge of social skills* (the activation of cooperative skills necessary to achieve mutual goals). It was observed whether or not the teachers activated pupils' prior knowledge on those

two domains. In case they did, it was observed whether they used a cooperative activity to activate prior knowledge. Two variables with three categories each were used in the analysis.

Two items dealt with the extent to which teachers specified clear instructional objectives for the lesson (3-point scale). One item addressed the specification of *academic objectives*, which define what pupils are to learn, and one addressed the specification of *social skill objectives*, which set out the interpersonal and small-group skills pupils will learn to cooperate effectively with each other.

Three items addressed teachers' grouping practices. One item concerned the forming of CL groups (teacher-selected or pupil-selected). Also one item dealt with group composition. Concerning group composition a distinction is made between heterogeneous groups (based on balanced ability, gender, ethnic background or social skills), homogeneous groups, random assignment and groups of convenience (e.g. pupils who sat near one another). Another item dealt with the size of the group (pairs, triads, groups of four).

Procedure

The staff development sessions and the coaching sessions took place during the school year 1999-2000. In September '99, prior to the start of the staff-development sessions, each teacher was observed during one lesson of 30-40 minutes. After completion of the sixth workshop, in May '00, each teacher was again observed for one lesson.

In order to control for the possible influences of lesson content and lesson structure, the teachers were asked to conduct a mathematics or language arts lesson in which they present some new learning material and to create opportunities for small group work to master the concepts being taught. At pretest and posttest, both treatment and control teachers were given these same directions for the observed lessons.

Results

Quantitative variables were constructed from the observational data for nine aspects of teachers' instructional skills related to cooperative learning, with one to three variables per aspect. Table 1 presents the descriptive statistics for these variables.

First of all, differences in teacher skills between the experimental and control group prior to the staff-development program were examined. No statistically significant differences at the 5%-level were found, except for evaluation of the group product, $t(68) = 3.63$, $p = .001$. The experimental teachers were more inclined to evaluate the group product, however mostly

without involving the pupils in the evaluation; the control teachers were more inclined to give a summary without any evaluation.

Insert Table 1 about here

For the observational category *structuring positive interdependence* in cooperative learning groups teachers of the experimental group scored on average higher at the posttest than teachers from the control group did. The analysis of covariance gave a statistically significant result, using the pretest as a covariate ($F(1,62) = 11.02, p = .00, MSE = 0.77$).

Before the training, hardly any teacher structured *individual accountability*. Partly because of that, a very low correlation between pre- and posttest was observed. Because it was not useful to use the pretest as a covariate, we used an independent samples t-test. At posttest the experimental group had a higher average than the control group, $t(63) = 4.46, p = .00$.

As noted before, on all three variables regarding to *face-to-face interaction* both groups scored high, even at pretest; this remained the same at posttest. The percentage of teachers reaching the highest possible rating on these variables varied between 73% and 97%.

For *attending to social skills*, a positive effect associated with the training was found, $t(63) = 2.09, p = .04$. At pretest, few teachers in the experimental or the control group paid attention to pupils' social skills. The trained teachers paid on average more attention to the pupils' social skills than control teachers did.

At the same time, trained teachers considerably more than control teachers *evaluated the way pupils cooperated*, $t(63) = 5.26, p = .00$. The training resulted in greater attention for *group processing*. On average, the trained teachers scored 3.66 at posttest, meaning that they evaluated the group process in the light of the social skills objective of the lesson. Moreover, to some extent they asked pupils to reflect on their own group cooperation. For *evaluating the group product* no differences between conditions were found at posttest, $t(63) = -0.71, p = .48$. At pretest, however, the experimental group outperformed the control group. Unexpectedly, the control group showed a considerable increase between pre- and posttest. Teachers of both groups on average evaluated the group product in the light of the academic goal for the lesson, but without giving pupils a role in the evaluation process.

Regarding the teachers' *monitoring* of group work, no statistically significant group differences were found at posttest, $t(63) = 0.30, p = .77$. Both groups showed improvement between pre- and posttest. For the experimental group this difference was statistically significant, $t(31) = 2.89, p = .007$. With respect to teacher *intervention* also no differences associated with the training could be found, $t(63) = -0.71, p = .48$.

Concerning the *combination of CL and direct instruction*, no summary variables were computed, because Homals resulted in different two-dimensional solutions at pretest (eigenvalues .35 and .29) and posttest (eigenvalues .29 and .25). Figure 2 presents the plots of the teachers' object scores, separately for the two observation periods. At pretest barely any differences between the two groups are noticeable. At posttest, however, the plot of the object scores (right panel of Figure 2) shows a rather strong, albeit not perfect discrimination between the two groups. To interpret the group differences, one must take into account how the original items and their categories are located in the two-dimensional space. Moving from the upper right of the plot down to the left, one first encounters mainly control teachers who did not combine DI with CL, whereas in the lower left part mainly teachers of the experimental group are found who used CL in combination with independent and guided practice. In the first quadrant a few (mostly experimental) teachers are found who combined CL with either reflection or daily review, and the third quadrant shows one outlier who combined CL with presentation. The first dimension of the posttest Homals solution may be interpreted as highly associated with the degree to which teachers combine CL with DI. The mean object scores on this dimension showed a clear difference in favor of the experimental group, $t(63) = 3.16, p = .002$.

Insert Figure 2 about here

No statistically significant differences were found activating *prior academic knowledge*, $t(63) = -0.74, p = .46$. The trained teachers, however, were at posttest significantly more activating prior knowledge with respect to *social skills* than teachers of the control group did, $t(63) = 2.95, p = .002$.

Concerning *specifying academic objectives* the teachers of the control group scored a little higher at posttest than trained teachers did, $t(63) = -1.35, p = .18$. Teachers of the

experimental group, however, scored at posttest higher than teachers of the control group concerning *specifying social skills objectives* ($t(63) = 1.89, p = .06$).

Additional observational data concerning the grouping practices of the teacher showed the following. At pretest, 77% of the teachers of the experimental groups formed the groups themselves. On the other hand, the teachers of the control groups formed the groups together with their pupils. At posttest, the teachers of both groups formed the groups themselves. At pretest, both teachers of the experimental and control groups assigned pupils to groups not deliberately (65 % of the teachers in the experimental group and 75 % of the teachers in the control group). The teachers of the experimental group already formed more heterogeneous groups at pretest (26,5%) than teachers of the control group (2,8%). At posttest, the teachers of both groups more deliberately formed the groups. Both groups of teachers made heterogeneous groups, but trained teachers formed heterogeneous groups based on pupils' academic abilities. With regard to group size, the teachers of both experimental and control groups let the pupils work in pairs, at pretest and posttest. At posttest, teachers of both groups more frequently let the pupils work in groups of four.

Standardized effect sizes (ES) were computed by dividing the mean group difference at posttest by a pooled standard deviation. Standard deviations at pre- and posttest for the two groups were pooled. The effect sizes are presented in Table 1. Large effect sizes were found for structuring positive interdependence, individual accountability, evaluation of the group process, combining CL and DI, and activating prior social knowledge. Medium effect sizes were found for attending to social skills, and specifying social skills objectives. All these effects were also statistically significant and in the expected direction. For 5 of the 12 variables no statistically significant differences between groups were found and effect sizes were negligible except for specifying academic objectives. For the latter variable, the control teachers scored on average higher at posttest than the trained teachers.

Discussion

The first year of our staff development program directed at implementing cooperative learning in elementary schools was evaluated by observing teacher behavior. Encouraging training effects were found. On some variables large effects in the expected direction were observed; on other variables, however, effects were small. A second year of continued staff development and peer coaching is under way to stabilize or improve these effects.

The results of this study show statistically significant training effects for four of the five basic elements of cooperative learning, as formulated by Johnson and Johnson (1994), namely for structuring *positive interdependence*, *individual accountability*, attention for *social skills* of the pupils and *evaluation of the group process*. These findings suggest that the teachers who participated in the staff development program on cooperative learning were able to implement the desired instructional behaviors.

Concerning the promotion of *face-to-face interaction*, no training effect was found. Most teachers of both groups performed well in this respect at both observation periods. Pupils in classrooms very often are already sitting together in small groups but do not actually work together as a group.

With regard to the *evaluation of the group product*, the teachers of the control group scored higher at post-test than teachers of the experimental group. The teachers of the experimental group, on the other hand, paid more attention to the *evaluation of the group process*. This difference between the two groups for both forms of evaluation can be interpreted as a possible effect of the training program. In the more traditional classrooms, with whole-class instruction, pupils are working predominantly alone. In this situation, the teacher stresses the outcomes of learning. In the staff development program on CL it is emphasized that besides the evaluation of the group product, teachers also should explicitly pay attention to the evaluation of the group process, to the way the pupils have worked together. The teachers were often reminded to finish a cooperative lesson by asking their pupils the following three questions: ‘what went well, what went less well, and what can be improved next time?’. The results from this study suggest that most of the teachers have followed this advice, but that this went at the expense of the attention of the evaluation of the group product. A revision of the staff development program may be needed, with a well-balanced approach of evaluating the group product as well as the group process.

The same could be said for specifying academic and social skills objectives of the lesson, and for activation of the pupils’ prior academic knowledge and of their prior knowledge of social skills. The teachers who participated in the staff development program were more specifying social skills objectives and were more activating prior knowledge concerning social skills than teachers who did not participate in the program. The untrained teachers, however, paid more attention to the specification of an academic objective of the lesson and were more activating the pupils’ prior academic knowledge than the trained teachers. In revising the program, attention should be paid to balance the importance of both the cognitive and social aspects of learning.

In general, the application of the direct instruction model implies that the teacher structures the learning activities of the pupils who, in this situation, remain rather passive. In our staff development program on CL, we tried to make the DI-model a more active model by advising teachers to use cooperative activities in one or more phases of the model, in order to actively involve pupils in the learning process. Especially during independent practice, cooperative work should be used instead of individual seatwork. The results of this study show that the teachers are able to do so.

Concerning the monitoring of the pupils during group work and teacher interventions, no significant differences between the teachers of the experimental and control groups were found. During the staff development program teachers were asked to intervene only when the members of the group were not able to solve the learning task or when the pupils lack the necessary skills to cooperate with each other. The findings of this study suggest that it was not always obvious to teachers when to intervene or not. In revising the program, the question of when to intervene and when not deserves further attention.

One of the limitations of this study is that the effect of the staff development program is based on one observation prior to the first workshop and one observation after the sixth workshop at the end of the school year, possibly limiting the representativeness of the observational data. Ideally, observational data should be collected on multiple occasions to provide information on the stability of teachers' cooperative instructional behaviors and the long-term effects of such a program. Therefore, in the second year of implementation of the program, the teachers will be observed again.

This study examined on the basis of classroom observation to what extent teachers are able to implement desired instructional cooperative behaviors in their classrooms, in order to create a context for their pupils in which they can cooperate effectively. However, to determine whether CL is assumed to be effective requires that the pupils engage in beneficial interaction for learning. Effective cooperation in learning groups requires the use of specific communication and helping skills (e.g. giving and receiving elaborated help). Analysis of pupils' verbal interactions in cooperative learning groups is needed to determine if pupils are able to work effectively in small groups. This will be one of the topics in our future research.

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Table 1

Descriptive statistics of the Cooperative Learning Observational Checklist and tests of training effects.

Observational categories	Experimental group						Control group				<i>t</i>	<i>ES</i>
	<i>Min</i>	<i>Max</i>	Pretest (<i>n</i> = 32)		Posttest (<i>n</i> = 32)		Pretest (<i>n</i> = 33)		Posttest (<i>n</i> = 33)			
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Positive interdependence	-1.75	1.78	.17	1.06	.43	.91	-.16	.94	-.41	.93	3.32**	.77
Individual accountability	1.00	5.00	1.53	1.02	3.06	1.61	1.24	.83	1.58	1.03	4.46**	1.29
Attending to Social skills	-1.04	3.39	.04	.97	.22	1.15	.06	1.09	-.21	.90	2.09*	.42
Evaluating group process	1.00	5.00	1.59	1.07	3.66	1.68	1.48	1.09	1.70	1.31	5.26**	1.50
Evaluating group product	1.00	5.00	2.81	1.49	2.94	1.63	1.48	.91	3.21	1.52	-.71	-.19
Monitoring group work	1.00	5.00	3.59	1.01	4.25	.72	3.76	1.30	4.18	1.07	.30	.06
Interventions	-1.93	5.57	.01	.73	-.09	.94	-.05	1.26	.09	1.15	-.71	-.18
Combining CL and DI	-2.17	4.07	-.26	1.14	.39	1.06	.21	.88	-.38	.89	3.16**	.77
Activating prior academic knowledge	1.00	3.00	1.59	.56	1.66	.65	1.42	.50	1.76	.44	-.74	-.19
Activating prior social knowledge	1.00	3.00	1.16	.37	1.50	.57	1.09	.29	1.15	.36	2.95**	.85
Specifying academic objectives	1.00	3.00	1.56	.80	1.56	.80	1.27	.63	1.81	.73	-1.35	-.34
Specifying social skills objectives	1.00	3.00	1.22	.55	1.72	.89	1.12	.33	1.36	.60	1.89	.57

Note: * $p < .05$, ** $p < .01$; ES = Standardized effect size

Workshop	Topics covered
1	Activation of teachers' prior knowledge of CL Competitive, individualistic, and cooperative learning situations Theoretical perspectives on CL Effects of CL CL methods incorporated in the direct instruction model
2	Five essential elements of CL Structuring positive interdependence Studying forms of positive interdependence via Jigsaw
3	Identifying group work problems Formulating rules for effective group work The teacher's role in CL ("a guide on the side") Making instructional decisions for using CL in the classroom Forming collegial teaching teams: purpose and procedure
4	Teaching cooperative skills Development of interpersonal and small-group skills Assessing pupils' interpersonal and small-group skills Defining skills via T-charts (examples of verbal and non-verbal behaviors) Creating role-cards for group members
5	Structuring individual accountability Face-to-face interaction Homogeneous and heterogeneous grouping Evaluating the quality and quantity of pupils' learning Processing how well the group functioned Observation and feedback
6	Building pupils' small-group helping skills Differences between elaborated and non-elaborated help Giving and receiving elaborated help Defining helping skills via T-charts Differences between disputational, cumulative and exploratory talk Typifying three kinds of talk via transcripts of pupil talk in groups

Figure 1. Overview of the topics covered in staff development program.

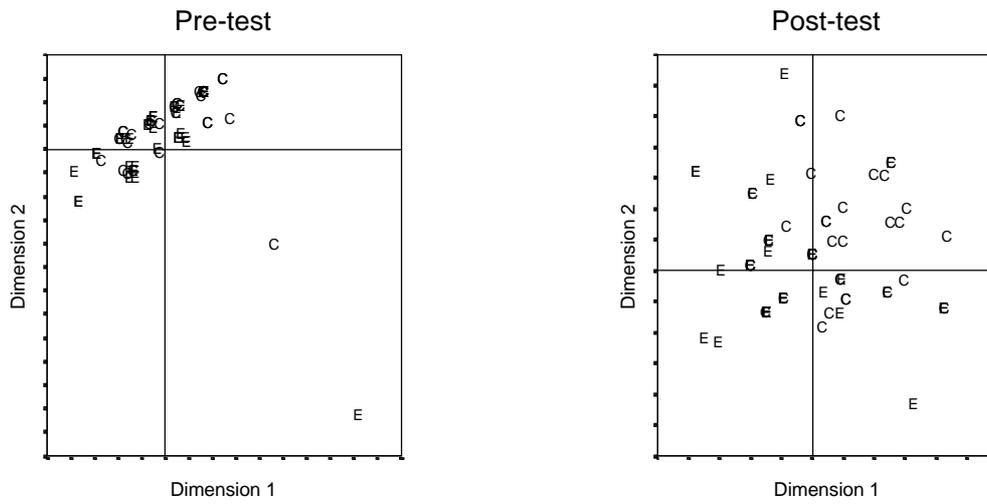


Figure 2. Combination of CL and direct instruction. Homals scores for the teachers of the experimental group (E) and control group (C) for the pretest and posttest separately.