The Influence of a Course on Direct and Activating Instruction upon Student Teachers' Classroom Practice

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1 Introduction

Educational research has highlighted the importance of maintaining an orderly classroom environment and providing both clear and well-organized instruction tailored to the needs of individual students. Time spent on direct instruction and particularly the direct instruction of basic skills is associated with school learning (Wang, Haertel & Walberg, 1993). With the increased interest in constructivistic conceptions of learning and teaching today, educators with constructivistic orientations contend that various forms of knowledge and skills are applied more generally when constructed by the learners themselves as opposed to explicitly taught: "knowledge is *made*, not *acquired*" (Phillips, 2000, p. 7). Such a view nevertheless often leads to an inclination to reject direct instruction by the teacher (see, for example, Brooks & Brooks, 1993). It should be noted, however, that many of the discussions of constructivistic orientations to learning and instruction are at the level of slogan and cliché (Duffy & Cunningham, 1996; Finn & Ravitch, 1996; Kozloff, 1998). In addition, the term constructivism has come to serve as an umbrella term for a diversity of views (Phillips, 1995; 2000).

It can be argued, however, that teachers may and should be more directive during the early phases of knowledge acquisition when students work on the basic skills and knowledge needed to solve complex problems. Once the basic skills have been mastered and the necessary knowledge systems are in place, teachers may tend to be more student oriented, apply cooperative learning methods, and utilize various group discussion techniques that require students to be more active. The dichotomy between so-called "lower-order" cognitive skills (e.g., learning factual content) and "higher-order" cognitive skills (e.g., reasoning and problem solving) is often misleading. All human activity involves both kinds of cognitive skills. Similarly, direct instruction can place students in a rather passive position, but also activate them. That is, the focus of direct instruction -- after the explanation of new information and the modeling of new skills -- is generally on concrete practice, which can be very useful and fulfilling to students. Dismissing direct instruction altogether may thus be throwing the baby out with the bath water. In combination with instructional methods that foster "cognitive apprenticeship" and have their roots in either an endogenous or dialectical orientation towards constructivism, direct instruction can be regarded as a powerful

educational tool. In a cognitive apprenticeship, students gradually take on greater responsibility as the cognitive support provided by teachers in the form of direct initial instruction, modeling, and scaffolding is diminished (Collins, Brown, & Newman, 1989). And in a cooperative learning setting (an important component of cognitive apprenticeship), students see other students at various stages in the mastery of particular skills, and knowledgeable peers can then provide support and assistance to less-knowledgeable peers (Slavin, 1996).

The purpose of the present paper is to examine the effects of a course that combines direct instruction and cooperative learning methods. More specifically, the effects of a pre-service course involving elements of direct instruction and cooperative learning on the instructional behaviors of prospective primary school teachers will be examined.

2 Direct Instruction

Primary school students who perceive links to and between the main ideas in lessons are more likely to learn and understand the content of these lessons than students who have difficulties perceiving such links. One way that teachers can facilitate the perception of such links is through well-organized lessons – that is, learning activities planned by the teacher to engage students in new (or not yet learned) academic content. When teachers carefully structure, sequence, and pace new information, students are more likely to process it in appropriate order and not miss a part of the sequence (Rosenshine & Stevens, 1986). This approach to teaching is called direct instruction and the practices implied by this approach are teacher-centered: face-to-face instruction is provided by the teacher to small groups of students using carefully articulated lessons in which the relevant cognitive skills are taught explicitly and also deliberately sequenced in a meaningful order.

Three lines of instructional research are relevant to direct instruction. The *first line* of research is based on the direct instruction model developed as part of the program entitled "Direct Instruction Systems for Teaching and Remediation: (DISTAR) by Engelmann and Bereiter in the context of the Project Follow Through (Engelmann, Becker, Carnine, & Gersten, 1988). Results of the Follow Through evaluation (1967 – 1995) showed students receiving direct instruction to perform significantly better academically than those receiving other forms of instruction that may be considered constructivist or student-centered (Engelmann, 1999; Wisconsin Policy Research Institute, 2001). Direct instruction is advocated by the American Federations of Teachers (1998) as one of six promising research-based schoolwide reform

programs that, when properly implemented, may help raise academic achievement, especially for struggling students.

The *second line* of research relevant to direct instruction is based on the outcomes of process-product studies. In this line of research, the instructional acts (processes) of more effective teachers whose students achieved higher scores on standardized tests (products) have been compared to the instructional acts of less effective teachers and further validated in experimental studies. The teaching functions found to be common to these studies were given the label direct instruction by Rosenshine and Stevens (1986). The teaching functions include: (a) teaching the content to be learned in small steps, including demonstration and modeling; (b) guided practice with the teacher leading the students in practice, providing prompts, checking for understanding, and providing corrective feedback; and (c) independent practice in order for the students to gradually move from integration of the new information or skill with previous knowledge to confident, smooth, and fluid performance based on the information or skill in question. The strength of direct instruction is its potential to teach complex content effectively in classroom settings and in relatively short periods of time. The teaching functions imply the use of a systematic model for teaching a lesson with considerable teacher responsibility for task completion, particularly in the first phase of a lesson. As described by Rosenshine and Stevens, direct instruction involves a generic teaching model awaiting subsequent interpretation and development by the teacher for particular applications (Wisconsin Policy Research Institute Report, 2001). Direct instruction appears to be very effective for disadvantaged students (Brophy, 1991) or low intelligent students (De Jager, 2002). Finally, direct instruction is regarded by the UNESCO as an effective educational practice (Walberg & Paik, 2000).

The *third line* of research relevant to direct instruction is based on studies of the outcomes of cognitive strategy instruction, which involves explicitly teaching students those strategies that people who are good at academic tasks routinely employ. Under the influence of the cognitive view of learning and instruction, the direct instruction approach has been refined and expanded with a greater emphasis on both cognitive and metacognitive strategies. Instructional scaffolding is considered an important component of successful teaching. Scaffolding consists of providing temporary support in the form of cues, aides, modeling, thinking aloud, or social support.

Research on cognitive strategy instruction shows increased learning to occur when a teacher explains a strategy to a student, places the student in a situation where the strategy can be applied, and carefully scaffolds the student's use of the strategy within this situation. With increased experience, there is less need for the teacher to assist the student and, in the end, the

student is capable of applying the relevant strategy flexibly and appropriately, and also coordinating its use with the use of other strategies and knowledge (Pressley, 1998).

The didactic perspective common to the three aforementioned research traditions involves direct and explicit instructional attention to the acquisition of complex concepts, skills, and learning strategies. The hallmark of such direct instruction is an active and directive role for the teacher in order to help students acquire our cultural heritage and to generate students' own knowledge in the form of concepts (knowledge that), propositions (knowledge why), strategies (knowledge how), and operations (knowledge how to). Direct instruction is explicit and extensive, with a great deal of supervised student practice and feedback from teachers. The proponents of direct instruction are guided by what is referred to by Sfard (1998) as the acquisition metaphor of learning or learning conceived of as the acquisition and accumulation of knowledge, concepts, skills, ideas, notions, meanings, senses, facts, representations, and contents.

A possible limitation on a direct instruction approach based on the acquisition metaphor is that learning is viewed as a largely individualistic enterprise. In contrast, proponents of a social constructivistic approach to learning maintain that the source of all knowledge lies in the continuing interaction between the student and the (social) environment with learning and understanding regarded as inherently social in nature (Salomon & Perkins, 1998). Drawing on the work of Piaget (1985) and Vygotsky (1978), the focus on learning and teaching is on the interdependence and interplay of both individual and social processes in the co-construction of knowledge and, along these lines, an instructional approach that encourages the interplay between social and individual learning processes is cooperative learning.

3 Cooperative Learning

Cooperative learning is the instructional use of small groups of students working together in order to maximize their own and each other's learning (Johnson & Johnson, 1994, 1999). In cooperative classrooms, the students are expected to help, discuss, and argue with each other; assess each other's current knowledge; and fill in any gaps in each other's understanding. Proponents of cooperative learning are guided by what Sfard (1998) calls the participation metaphor. The learner, according to this metaphor, is construed as a person interested in participating in activities rather than in accumulating information or things.

Numerous studies have demonstrated the effectiveness of cooperative learning methods for the promotion of student learning and social relations relative to more traditional whole-

class methods of teaching (Cohen, 1994b; Johnson & Johnson, 1994; Slavin, 1995). In order for a lesson of be cooperative, five basic elements are essential (Johnson & Johnson, 1994, 1999) and need to be included: (a) positive interdependence or the perception on the part of group members that they must work together to accomplish a common goal, (b) individual accountability or group members being held responsible for contributing to goal achievement, (c) face-to-face interaction or group members meeting to promote one another's work, (d) the development of social or small-group skills, which are those interpersonal skills needed to work in a group, and (e) group processing or group reflection on the collaborative effort and group decisions on how to improve effectiveness. In a comprehensive review of the effects of cooperative learning, Slavin (1995; 1996) observed that cooperative learning 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 students to help each other and encourage maximum effort.

According to Slavin (1995), cooperative learning methods for mastering academic content at school rarely replace direct instruction by the teacher but, rather, individual seatwork, individual study, and individual drill. Cooperative activities are generally linked to some form of direct instruction, and direct instruction by the teacher should thus be followed by some form of small-group practice to help students master the content and skills addressed in the lesson.

In light of the foregoing considerations of the value of direct instruction in combination with cooperative learning, the Department of Educational Sciences at the University of Nijmegen and the Christian Pedagogical Study Centre (CPS, Amersfoort) undertook the development of a pre-service training course involving both elements of direct instruction and cooperative learning. Initial instruction is provided by the teacher in the form of explicit explanation of new concepts, skills, processes, models, or examples. Cooperative learning activities are then undertaken to encourage (i.e., activate) students to take responsibility for their learning and provide an incentive for helping other members of the group learn as well. In fact, cooperative learning in the present study was defined as collaborative seatwork and, in the present study, the effects of the training course aimed at facilitating the use of direct and activating instruction in combination with collaborative seatwork are examined.

4 Research Questions

The specific research questions guiding the present study were as follows: 1) Do those student teachers who participated in the course implement direct and activating instructional skills to a greater extent than those student teachers who did not participate in the course?; 2) Do those student teachers who participated in the course appear to value the new course on direct and activating instruction?

5 Method and Instrumentation

5.1 Design

The participants in the study were student teachers from three teacher education colleges enrolled in their first or second year of preparation for primary school teaching. Colleges A and B were located in the west of the Netherlands and college C in the middle of the country. At each location, two sub-studies were undertaken: (a) an observational study of the implementation of the desired direct and activating instructional skills; and (b) a questionnaire study of the reactions of the trained student teachers to the course on direct and activating instruction. Two forms of observation were undertaken. First, the use of direct and activating instructional skills was rated by *external observers* present in the classroom of the student teachers. Second, the use of direct and activating instructional skills was rated by *cooperating teachers* observing the student teachers in their classrooms. Both sets of evaluations concerned the degree of implementation of the target skills by the student teachers in a pre-test post-test untreated control group design. The questionnaire was administered to only those student teachers who participated in the course (one-group post-test-only design).

5.2 Subjects

A letter of invitation for participation in a course devoted to direct and activating instructional skills was sent to each of the Dutch teacher education colleges for primary school teachers. About half of the colleges showed an interest in the course. Due to differences in: the timetables of the colleges, the enrollment years of the student teachers, the school practicum periods, the primary grade levels taught by the student teachers, and the time constraints on the external observers, three colleges were selected to participate in the study.

At college A, the course was elective. Sixteen student teachers enrolled in their second year of training showed in interest in the course on direct and activating instruction. Two of the second-year student teachers following another elective course were prepared to act as control student teachers after receiving an e-mail requesting them to participate in the study. Additional student teachers were not able to participate as control subjects due to their time constraints.

At college B, the course on direct and activating instruction was mandatory. Two of the three first-year classes at this college were randomly selected as the treatment group (n = 30). The remaining class participated as the control group and followed a traditional course on effective instruction (n = 15).

At college C, the course was also elective. Nineteen student teachers enrolled in their second year of training showed an interest in the course on direct and activating instruction. Ten of the second-year student teachers following another elective course were prepared to participate in the study as control subjects.

In sum, the treatment group consisted to 65 student teachers enrolled in either their first (n = 30) or second year (n = 35). The control group consisted of 27 student teachers also enrolled in either their first (n = 15) or second year (n = 12). The majority of the student teachers undertook their school practicum in grades 5 and 6. Of the 65 questionnaires distributed to gain insight into the student teachers' attitudes towards the course on direct and activating instruction, 63 were returned at post-test (response rate of 97%).

A total of 38 student teachers were randomly selected for observation by *external observers*. At pre-test, 26 students from the treatment group were observed and 12 students from the control group. At post-test, 25 students from the treatment group were observed (one student teacher was sick) and 12 from the control group. The observed treatment group at both pre-test and post-test thus consisted of 25 student teachers; the observed control group consisted of 12 student teachers.

Of the original group of 92 student teachers, 88 were rated by their *cooperating teachers* for the use of direct and activating instructional skills at pre-test (treatment group n = 65; control group n = 23). At post-test, 75 of the student teachers were rated by their cooperating teachers (treatment group n = 57; control group n = 18). Of the ratings, 95% were returned at pre-test and 84% at post-test. The group of student teachers rated by their cooperating teachers at both pre-test and post-test thus consisted of 57 student teachers from the treatment group and 18 from the control group. Table 1 shows the number of student teachers from the

three colleges participating in the study and the number of observations made by the external observers and cooperating teachers in each case.

5.3 Lesson format

In order to control for the possible influence of lesson content, the student teachers were invited to teach a mathematics lesson concerned with how to calculate the area of a geometric figure and provided with a number of guidelines for how to do this. The lesson guidelines included specification of the instructional objectives of the lesson, a short description of the lesson content, assignments for practice, and two to three worksheets for the students. The student teachers were first asked to present the new learning material provided in the lesson description and then create opportunities for the primary school students to practice the newly learned information. These opportunities for practice could be realized by the student teachers via independent practice or small group work (i.e., cooperative activities), but no hints were given in one direction or the other. Various lessons were developed for grades one through six and for both pre-test and post-test. Each lesson followed the same structure and guidelines; the only differences were in the difficulties of the lessons in keeping with the different grade levels. At pre-test and post-test, both the treatment and control student teachers were given the same guidelines for the observed lesson.

5.4 The Course on Direct and Activating Instruction

The course entitled Direct and Activating Instruction was developed primarily on the basis of the direct instruction model as described by Rosenhine and Stevens (1986; see also Rosenshine, 2002), Brophy and Good (1986), and Good and Brophy (2000), and further supplemented with forms of scaffolding derived from the cognitive strategy instruction literature (Pressley & Wolyshyn, 1995). The core of the underlying instructional model consists of eight teaching functions: 1) daily review, 2) preview, 3) presentation of new material, 4), guided practice, 5) independent practice, 6) reflection, 7) review/preview, and 8) feedback and correction.

In addition to the inclusion of active learning elements from the revised direct instruction model (e.g., active processing of information, stimulating student engagement, verbalization of internal thoughts, having students solve their own problems, having students evaluate their own work), the course also pays attention to the use of small group work in the form of cooperative learning. Johnson and Johnson's (1994) five essential elements are used

to classify group work as cooperative: positive interdependence, individual accountability, face-to-face interaction, development of small-group skills, and group processing. After new information is presented about direct and activating instruction and cooperative learning, the student teachers work together themselves in cooperative groups using four cooperative learning structures: Think-Pair-Share, Numbered-Heads-Together, Pairs (Kagan, 1994), and Placemat (Craigen & Green, 1999). These structures are content-free manners of organizing social interactions within the classroom and provide "discrete, bite-sized learning units for teachers" (Kagan & Kagan, 1998, p. 106). When compared to other approaches to cooperative learning, Kagan's structural approach is easier to implement because the student teachers can acquire the structures one-at-a-time. In Kagan and Kagan's (1998) view, the cooperative learning structures thus constitute the perfect starting point for mastery of cooperative learning methods.

The present application of the course consisted of three workshops with three weeks in between each workshop and each workshop lasting three hours. Before each workshop, the student teachers were asked to study the topic to be covered in the training manual. Following each workshop, the student teachers received an assignment requiring them to put that which they had learned during the workshop into practice (e.g., after the first workshop, the student teachers were asked to observe a lesson provided by their cooperating teachers and identify the elements of direct and activating instruction; the student teachers were also asked to prepare and teach a lesson based on direct and activating direct instruction approach as described in the training manual. During each workshop, time was also set aside to discuss the student teachers' experiences with the implementation of the direct and activating instruction elements in their classrooms. Background information on the topics considered in the three workshops was provided in a manual distributed to each student teacher prior to the first workshop.

In the design of the workshops, the effective training components identified by Joyce and Showers (1995) were used: (a) presentation of theory, (b) modeling or demonstration, (c), practice, (d) structured feedback, and (e) coaching. The theory is presented in the training manual. The modeling and demonstration of direct and activating instruction and the four cooperative learning structures was done by the trainers (each workshop was set up according to the direct activating instruction approach integrating the cooperative structures) or by presenting case studies in the training manual. Practice was achieved via role playing, for instance, and asking the student teachers to experiment with the direct and activating instructional skills and use of cooperative activities in their own classrooms followed by

discussion of these experiences at the next workshop. Coaching was provided by the cooperating teachers and is regarded as an important strategy for transfer of learning (Joyce & Showers, 1995; Veenman & Denessen, 2001).

The course was conducted by two educational science students with experience in direct instruction and cooperative learning under the supervision of an experienced teacher educator. During the course, the student teachers practiced teaching one day a week at the primary schools.

5.5 Data Collection

The Direct and Activating Instruction course was conducted during the second semester of the teacher education program. Prior to the start of the course, each student teacher was observed during one mathematics lesson (see lesson format). After completion of the course, each student teacher was again observed during one mathematics lesson (same class, same grade). The observed lessons lasted about 40 minutes.

The observation schedule for the cooperating teachers were distributed to the student teachers themselves with the request that the cooperating teachers fill in the schedule after completion of the student teachers' lessons. The student teachers did not have access to the schedule and the ratings provided by the cooperating teachers. The course evaluation questionnaire was administered after completion of the course to each student teacher.

5.6 Direct and Activating Instruction Observation Schedule

During each classroom observation by the external observer or cooperating teacher, the observer used the Direct and Activating Instruction Observation Schedule (DAIOS) to rate the instruction skills used by the student teachers. This schedule contains 30 items pertaining to the instructional behaviors of the student teachers. First, the observer recorded whether a particular instructional skill was used by the student teacher or not (yes/no). Second, the observer rated how well the instructional skill was executed along a four-point Likert scale (1 = *poor*; 4 = *excellent*). The construction of these items was mainly based on the research of Rosenshine and Stevens (1986), Rosenshine and Meister (1994), Pressley and Woloshyn (1995), and on an earlier version of this schedule used by Veenman, Bakermans, Franzen, and Van Hoof (1996) to evaluate a pre-service training course on effective instruction for secondary education teachers.

Prior to the collection of the observational data, the two external observers went through a training program of about 40 hours. This program involved the coding of five lesson videotapes as well as the live coding of seven mathematics lessons. Inter-observer agreement checks were based on the coding of 15 mathematics lessons at three schools not involved in the study. The inter-observer agreement for the items from the observational schedule was calculated by dividing the number of agreements by the total number of agreements plus disagreements and multiplying by 100 and also using Cohen's (1960) Kappa. The mean inter-observer agreement across the items was 91%; the mean coefficient for Cohen's Kappa was .86.

The DAIOS was also used by the cooperating teachers to rate the use of instructional skills by the student teachers. Prior to pre-test, the cooperating teachers were informed about the purpose of the study and the content of the course on direct and activating instruction. They also received a brief description of the direct and activating instruction model.

Based on the results of a factor analysis, two factors or scales could be formed: (a) A*ctivating Instruction* (e.g., Item 1: "At the start of the lesson together with the students, the teacher determines what they already know about the topic to be addressed" and Item 12: "The teacher stimulates the students to seek solutions by themselves", and (b) *Cooperative Practice* (e.g., Item 20: "The teacher instructs the students on how the cooperation should proceed" and Item 22: "The practice assignment can only be completed with cooperation -- the students are dependent on each other". These two factors accounted for 53% of the rating variance. The factor analysis was based on the post-test ratings provided by the external observers. Seven items were deleted from the schedule because of low factor loadings or low discriminating power. The final version of the observational schedule thus contained 22 items (oblimin rotation; correlation between the two scales = .39). The Cronbach alpha for the scale Activating Instruction was .86 (17 items); for the scale Cooperative Practice, it was .92 (5 items).

5.7 Course Evaluation Questionnaire

This questionnaire was developed to assess the student teachers' reactions to and their evaluations of the course on direct and activating instruction and contains 34 items. The student teachers are asked to judge along a five-point Likert scale: (a) the internal quality of the training manual; (b) the external quality of the training manual; (c) the quality of the workshops; and (d) the practicality of the course. The Cronbach-alpha coefficients for the

rating scales ranged from .69 to 86; see Table 4. The questionnaire also contained eight open-ended questions regarding possible suggestions to improve the course.

5.8 Data Analysis

For each observed lesson, the mean scores for the DAIOS scales Activating Instruction and Cooperative Practice were computed by averaging the item values. For the data pertaining to course evaluation, the mean scores for each of the subscales were also computed.

Analyses of covariance (ANCOVA) were used to examine the differences between the post-test scores for the treatment groups and the control groups as rated by the trained observers and cooperating teachers, with the pre-test scores as the covariate. A significance level of 5% was used in all of the statistical tests. The interest in this study lies in the effects of the course on the use of direct and activating instruction by the student teachers. Hence, the unit of analysis is the individual student teacher rather than the class being taught.

6. Results

A summary of the DAIOS scores for the treatment and control student teachers is presented in Table 2. Comparison of the treatment group with the control group for differences *prior* to the course revealed no significant differences in the DAIOS scores provided by either the external observers or the cooperating teachers ($p > .05$). In addition, no initial differences were found between the scores of the student teachers from the three teacher education colleges. However, significant initial differences were found between the DAIOS scores provided by the external observers versus the cooperating teachers. At pre-test, the cooperating teachers generally rated their student teachers higher than the external observers ($t = -8.51$; $p < .05$).

The ANCOVA results presented in Table 2 show the course to have a marked effect on the use of direct and activating instructional skills by the student teachers. The observations by the external observers as well as by the cooperating teachers showed significant differences between the student teachers in the treatment versus control groups ($p < .05$). Effect sizes (d) were calculated by dividing the mean differences between the post-test and pre-test scores for the treatment versus control groups by the pooled standard deviations for the scores of the treatment and control groups at pre-test (Carlson & Schmidt, 1999). The relatively large effect sizes (ESs = 1.80 and 1.17, respectively) for the Activating Instruction

scale were all in favor of the treatment group. In addition, the course appeared to be effective for the treatment students from all three colleges.

Inspection of the scores for the DAIOS Cooperative Practice scale showed no cooperative practice activities to occur in either the treatment or control groups at pre-test and also in the control group at post-test. A summary of the post-test scores for only the treatment group on the Cooperative Practice scale is therefore presented in Table 3. As can be seen, 52% and 35% of the treatment group student teachers were rated by the external observers and cooperating teachers, respectively, as applying cooperative methods at post-test with a mean score of 2.4 provided by the trained observers and a mean score of 2.3 provided by the cooperating teachers (along a four-point scale).

In Table 4, an overview of the evaluation scores by the student teachers who participated in the course is presented. The scores could vary from 1 (*poor quality*) to 5 (*high quality*). The mean scores provided by the student teachers on the different rating scales show them to rate both the internal and external quality of the training manual, the workshops, and the practicality of the course very positively.

7. Discussion

The results of the present study show the course on direct and activating instruction to positively influence the instructional skills of student teachers. The treatment student teachers were rated significantly higher by the external observers and cooperating teachers on the scale for Activating Instruction than the control student teachers. This effect was also found for student teachers enrolled in either their first or second year at all three of the different teacher education colleges. The items constituting the scale for Activating Instruction showed the treatment student teachers to use such instructional skills as the following relatively more often than the control student teachers: activating prior knowledge, providing an overview at the beginning of a lesson so that the students get a picture of the structure and the main points of the lesson, providing clear and detailed instructions, using think-aloud procedures and scaffolds, prompting students to react to each other, providing practice with guidance, prompting students to seek solutions by themselves and also to explain their solutions, using questions to check for understanding, and providing feedback and correction. These are important instructional skills that can activate students within the context of a direct instruction lesson and have been shown to relate to student achievement (Rosenshine & Stevens, 1986; Good & Brophy, 2000; Pressley & Woloshyn, 1995; Walberg & Paik, 2000).

In contrast to the successful implementation of direct and activating instructional skills, the treatment student teachers showed less success with the use of cooperative practice activities in their lessons. During the course, the student teachers were stimulated to utilize cooperative activities during that part of the lesson when the students are expected to practice with the learning content previously explained by the teacher. During the workshops, moreover, the student teachers worked together in cooperative groups using the four cooperative learning structures suggested by Kagan (1994) and Craigen and Green (1999): Think-Pair-Share, Numbered-Heads-Together, Pairs, and Placemat. These structures were used in order to show the student teachers how cooperative activities can actually be organized and provide direct experience with the activities and thereby insight into their practical value. At post-test, however, only 35% to 52% of the treatment group student teachers were found to use cooperative activities during independent practice. In addition, examination of the scale scores shows those cooperative activities undertaken to not be clearly structured. Improved training on how to implement cooperative activities thus constitutes a possible direction for future research.

The relatively infrequent use of cooperative practice activities by the treatment student teachers can be explained as follows. First, the emphasis in the training manual and workshops was on direct and activating instructional skills supplemented by activities intended to activate primary school students during the independent phase of a lesson. Cooperative activities were also proposed for the latter purpose, and four concrete examples of structured cooperative activities were modeled and practiced during the workshops. The time devoted to cooperative practice activities may have been too small to prepare the student teachers for actual utilization of such activities although most of the student teachers positively viewed cooperative learning as a means of promoting academic progress and the development of important social skills (not only for the primary school students but also for themselves) and also appreciated the opportunity for greater interaction with their peers. In revising the course, more instructional time and practice should thus be devoted to the cooperative learning component. A recent study by Veenman, Van Benthum, Bootsma, Van Dieren, and Van der Kemp (2002) has shown such an approach to be successful in the context of teacher education.

Second, independent practice or seatwork is still regarded by most teachers and student teachers as an individualistic enterprise. Observations in Dutch classes have shown little active engagement in learning directly from other students. Although students are mostly seated in small groups, each student usually works and achieves alone (Veenman, Kenter, & Post, 2000). The dominant pattern of classroom organization for instruction is still whole class with an accent

on individual learning and in such a context, attempts to have student teachers implement cooperative learning activities are difficult to realize.

Finally, most of the instructional skills related to the direct and activating instructional approach were rather new to the student teachers studied here. Most of their energy and attention was thus devoted to the implementation of instructional activities directly related to their role as a teacher. The structuring of cooperative practice activities for the primary school students obviously related more to the learning of the students than to the student teachers' own learning of important instructional skills and may also, therefore, be viewed as less important.

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Table 1

Number of trained and untrained student teachers from the three teacher education colleges participating in the study

	Participants	Observations by external observers		Observations by cooperating teachers	
Groups	*N*	Pre-test	Post-test	Pre-test	Post-test
College A					
Treatment group	16	6	5	16	16
Control group	2	0	0	1	1
College B					
Treatment group	30	10	10	30	24
Control group	15	6	6	14	11
College C					
Treatment group	19	10	10	19	17
Control group	10	6	6	8	6
Total	92	38	37	88	75

Table 2

Mean DAIOS scores for Activating Instruction provided by external observers versus cooperating teachers for treatment and control student teachers

			Pre-test		Post-test			
Observers	Group	*N*	*M*	*SD*	*M*	*SD*	*F*	*d*
External observers	Treatment	25	1.40	.41	2.85	.59	25.46*	1.80
	Control	12	1.50	.40	1.92	.46		
Cooperating teachers	Treatment	57	2.11	.75	2.90	.56	19.30*	1.17
	Control	16[1]	2.31	.90	2.44	.68		

Note. Tests for parallel slopes of pre-test on post-test scores within groups were non-significant. The Mean DAIOS scores are based on a four-point scale: 1 = poor, 4 = excellent.

[1]) Two student teachers were omitted from the control group owing to extreme scores.

* $p < .05$

Table 3

Number of treatment group students applying and not applying cooperative activities at post-test and mean post-test DAIOS Cooperative Practice scale scores provided by external observers and cooperating teachers

	Application			No application	Number of student teachers observed
Observers	*N*	*M*	*SD*	*N*	*N*
External observers	13	2.40	1.01	12	25
Cooperating teachers	20	2.28	1.06	37	57

Note. The Mean DAIOS scores are based on a four-point scale: 1 = poor, 4 = excellent.
Zero scores at pre-test for both treatment and control student teachers and at post-test for control student teachers because cooperative practice activities did not occur.

Table 4

Mean Course Evaluation Questionnaire rating scale scores provided by treatment group student teachers (*n=63)*

Rating scale	*M*	*SD*
Internal quality of the training manual (8 items, α = .85)	3.96	.49
External quality of the training manual (4 items, α = .69)	3.99	.60
Quality of the workshops (10 items, α = .83)	3.84	.56
Practicality of the course (6 items, α = .86)	4.05	.57

Note. The scores are based on a five point scale: 1 = very bad/very unclear/not at all, 5 = very good/very clear/very much.