

Effects of Cooperative Learning on Academic Achievement of Primary Pupils:

A Systematic Review

Master's Thesis

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## Introduction

Research on cooperative learning was scarce before 1970's, however since this date the amount and the quality of research on cooperative learning has greatly accelerated given its great appraisal and positive effects on education (Slavin, 1996). Numerous studies have stressed the positive effects that cooperative learning has on academic achievement (Jensen et al., 2002; Johnson et al., 1988; Gillies & Ashman, 1996; Rojas-Drummond, Hernandez, Velez, & Villagran, 1998; Ferguson-Patrick, 2007) and social interaction (Jordan & Le Métais, 1997; Vasileiadou, 2009; Choi, Johnson, & Johnson, 2011) among other outcomes. Cooperative learning has become such a widely used instructional procedure in all educational contexts that it is even difficult to find instructional material that does not refer to this methodology (Johnson, Johnson & Stanne, 2000).

As of 2009 more than 1,200 research studies had been conducted on cooperative learning, and a significant amount of those studies focused on the effects of cooperative learning on achievement in comparisons to more traditional, individualistic or competitive instructional methods (Johnson & Johnson, 2009). However, even though a vast amount of studies have corroborated the positive effects of cooperative interventions, there have also been studies (Galton, Simon & Croll, 1980; Baines, Blatchford, & Kutnick, 2003; Veenman, Van Benthum, Bootsma, Van Dieren, & Van der Kemp, 2002) which have diminished the positive appraisal of cooperative interventions, arguing that pupils often sit in small groups but are rarely assigned to real collaborative tasks.

Individual studies on cooperative learning have provided relevant and sometimes contradictory information about its effectiveness. Peticrew and Roberts (2006) have pointed out that individual studies in a given domain often contradict among each other; consequently, it is better to understand a problem by examining and comparing data from different sources in the same domain. Literature reviews, systematic reviews, and meta-analysis are research methods that allow researchers to critically appraise the individual contributions of different studies in order to allow a better understanding of a problem (Peticrew & Roberts, 2006).

Literature reviews and meta-analysis conducted on cooperative learning have provided relevant information about the effectiveness of different cooperative learning methods (Johnson, Johnson, & Stanne, 2000), the effects of cooperative learning on the academic achievement of students with learning disabilities (Nyman & Fuchs, 2002), the effects of cooperative learning on achievement in comparison to competitive and individualistic methods (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981), and the effects of cooperative learning on specific subjects in higher education (Bowen, 2000). These reviews

have appraised the individual contributions of studies and have increased the knowledge that investigators and educators have about the overall effectiveness of cooperative and collaborative interventions.

However, despite their relevance, no literature or systematic reviews that exclusively analyze the effects of cooperative or collaborative interventions on primary pupil's achievement were found in a literature review conducted within the last decade. The absence of reviews triggers questions about the effectiveness of cooperative learning on primary education, where students may or may not have developed group-work skills. Consequently, in an attempt to provide some explanations on this topic, the present master thesis analyzes the effects of cooperative learning on the academic achievement of primary pupils, by appraising the contribution of individual studies conducted in the last decade in this domain.

### **Cooperative learning**

Cooperative learning has been defined by Johnson and Johnson (1994) as a situation in which there is a positive interdependence among student's goal attainment; therefore, students perceive that they can only reach their learning goals if all the members of the group achieve the learning goals as well. Cooperative learning is an instructional methodology which splits class members into small groups in order for them to learn assigned material and make sure that all members of the group master the assignment (Johnson & Johnson, 1994).

According to Johnson and Johnson (2009) cooperative learning is more than just asking students to sit and work together. Research has identified some components that mediate the effectiveness of cooperative learning, such as: (a) *positive interdependence*, which allows students to perceive that they are linked with each other in such a way that one cannot succeed unless everyone succeeds, (b) *individual accountability*, which gives each member of the group a sense of personal responsibility toward goal achievement, (c) *promotive interaction*, which takes place when students facilitate each other's efforts to learn through exchanging resources, help, motivation, and points of view, (d) *interpersonal and small-group skills*, which means that students must be taught social skills for high quality cooperation, and (e) *group processing*, which exists when group members discuss how well they are achieving their goals and maintaining their working relationships (Johnson & Johnson, 2009).

Cooperative learning has also been closely related to concepts such as collaborative learning or group learning. The broadest definition of collaborative learning is that it is a situation in which two or more people learn something together (Dillenbourg, 1999). Similarly group learning has been defined as the physical placement of students into groups and the usage of specific instructional strategies for the purpose of learning (Lou et al., 1996). For the purpose of this review, cooperative learning is defined as:

students working together in small groups which allow everyone to participate in group tasks that have been clearly structured and defined, this definition is broad and encompasses the concepts of collaborative as well as group learning (Cohen, 1994).

Cooperative learning differs from traditional whole-class instructions in which students are taught as a single large group by a teacher (Lou et al., 1996). According to the author, traditional whole-class encourage teacher explanations over peer interactions, and encompass benefits such as uniformity of instruction, since students are exposed to the same type of information and learning methodology (Lou et al., 1996). Cooperative learning in contrast favors the division of whole classes into small group work, in order for students to challenge their individual knowledge and skills by developing structured group tasks. Research on cooperative learning has paid special attention to the effects of cooperative learning in comparison to traditional teacher center instruction (Johnson & Johnson, 1994)

### **Outcomes of cooperative learning**

Past research on cooperative learning has focused on a wide variety of outcomes that such an instructional method may enhance, such as: academic achievement, motivation, social development, moral reasoning, social support, self-esteem, friendship and attitudes towards a task, among other outcomes (Johnson, Johnson & Stanne, 2000). However, special attention has been given to the effects of cooperative learning interventions on academic achievement, as this instructional methodology is considered to enhance learning gains and higher order thinking due to the substantive conversations and active learning that it promotes (Cohen, 1994). Moreover, cooperative learning gives learners the opportunity to verbalize their individual knowledge, which may lead to higher cognitive elaboration, deeper reflections, awareness of individual knowledge and misconceptions, and expansion of knowledge (Van Boxtel, 2000).

Various studies have analyzed the effectiveness of cooperative learning on achievement in different educational levels and subjects areas. For example, Jensen, Johnson, and Johnson (2002), examined the effects of cooperative learning on students' attainment of physics in higher education, finding significant positive effects of cooperative learning interventions. Similarly, Doymus (2008) examined the effectiveness of the jigsaw cooperative learning method in teaching chemistry in a university context and found out that the students in the jigsaw group were more successful than those who received traditional instruction. Meanwhile, Smialek and Boburka (2006) investigated the effectiveness of cooperative learning on college students' development of musical skills and found that cooperative interventions proved to be more effective than traditional lectures or occasional group work. Gilles and Ashman (1996) investigated the effects of cooperative learning on primary pupils' behavioral

interactions and academic achievement (verbal comprehension, verbal reasoning, quantitative reasoning and figural reasoning) and found that children in the intervention group showed more autonomy and significantly higher academic achievement after the intervention.

Despite the positive effects of cooperative interventions on academic achievement in a variety of educational levels and academic subjects, Galton, Simon, and Croll, (1980) found that primary classrooms teachers often place children in groups, but children do not necessarily develop collaborative work. As previously mentioned, simply placing students together does not have to have positive effects on academic achievement. In order for cooperative learning interventions to be effective teachers need to structure tasks which promote positive interdependence, individual accountability, promotive interaction, interpersonal and small-group skills and group processing (Johnson & Johnson, 1994). Baines, Blatchford, and Chowne (2007) have indicated that teachers often lack the proper training to implement cooperative learning interventions that encompass all the components that enhance effective interventions.

The aforementioned critics toward cooperative learning raise questions regarding the real effectiveness of cooperative learning on primary education exclusively. Additionally Kutnick, Ota, and Berdondini (2006) have indicated that many studies which analyze the effects of cooperative interventions have been conducted in the higher range of primary and secondary education. This is perhaps because it is believed that younger children have difficulties showing the required social and communicative skills required for cooperative or collaborative learning. These arguments call attention to the need to better understand the effects of cooperative learning exclusively on primary education.

### **Meta-analysis, Literature, and Systematic Reviews on Cooperative Learning and Achievement**

In an early attempt to analyze the effects of cooperative learning on academic achievement, Johnson et al. (1981) reviewed 122 studies and analyzed the effect of learning goal structures of cooperative, competitive, and individualistic learning on students' academic achievements. Results of the meta-analysis showed that cooperative learning promoted higher achievement than competitive and individualistic learning (Johnson et al, 1981).

Similarly, Johnson, Johnson, and Stanne (2000), conducted a meta-analysis studying the effectiveness of cooperative methods on students' achievement. Even though cooperative learning has been defined by the aforementioned authors as a generic term that describes a way of perceiving instruction and can be adopted by any teacher, diverse research on cooperative learning has developed specific cooperative learning methods, such as: Complex Instruction, Constructive Controversy,

Cooperative Integrated Reading and Composition, Cooperative Structures, Group Investigation, Jigsaw, Learning Together, Student Teams Achievement Divisions, Teams-Games-Tournaments, and Team Assisted Individualization. Results of the meta-analysis showed that all cooperative learning methods analyzed, improved student's achievement in comparison to competitive and individualistic method. Furthermore, Learning Together, Constructive Controversy, Teams-Games- Tournaments, and Group Investigation methods showed higher positive effects on achievement.

In 1996 Lou et al. conducted a meta-analysis to analyze the effects of small group learning on students' achievement, attitude toward subjects and self-conceptions. Results showed the positive effects of placing students in small learning groups; however, the magnitude of the intervention's effects showed variations across findings. Lou et al. (1996) found that different instructional treatments enhanced variability in the results. Both learning goals interdependence and teacher training in cooperative learning seem to positively affect the outcomes of the interventions. Effects of group learning were also larger in math and science than in other subjects, such as language. The researchers attribute this result to the complex nature of the tasks involved in math and science, which may favor peer assistance and group collaboration.

In a 2002 literature review Nyman and Fuchs investigated the effects of cooperative learning on the achievement of students with learning disabilities. They analyzed fifteen studies and found mixed-achievement outcomes; only 6 of the 15 studies reported statistically significant effects favoring cooperative learning. Additionally, they found that individual accountability and group rewards were important factors in improving achievements of students with disabilities. In a review of the effects of cooperative learning on academic achievement of primary and secondary student, Slavin (1983) found that cooperative incentive structures (rewards that groups receive for working cooperatively) defined the extent of the cooperative interventions efficacy. These findings suggest that cooperative learning has positive effects on student's achievement, when students perceive or obtain a reward from the fact of working together, consequently the reward mediates the instruction level of effectiveness.

Targeting a different age range, Bowen (2000) conducted a meta-analysis to assess whether cooperative learning was more effective than traditional instruction at enhancing academic achievement, persistence, and attitudes among undergraduate students in the subject areas of science, mathematics, engineering, and technology courses. In the meta-analysis 37 research studies were reviewed with results indicating that cooperative learning had a significant and positive effect on achievement of college students in science, mathematics, engineering, and technology.



The aforementioned reviews provide relevant appraisals of the effects of cooperative learning on academic achievement in different educational levels and academic subjects. However, in the literature search conducted, no literature or systematic reviews that exclusively analyze the effects of cooperative learning on primary education were found. Such a literature or systematic review is highly relevant, as some research (e.g. Kutnick, Ota, & Berdondini, 2006) has pointed out that primary pupils may not have enough competencies to take full advantage of cooperative learning interventions. Consequently, it is important to understand the extent to which cooperative interventions may or may not have positive impact on primary pupils' achievement. Given this gap in the literature, the present master thesis conducts a systematic review to appraise the effects of cooperative learning on primary pupils' achievement.

Systematic reviews have been defined by Petticrew and Roberts (2006) as literature reviews that adhere closely to a set of scientific methods in order to identify, appraise, and synthesize relevant studies that may answer research questions. Systematic reviews are research methods that critically appraise and summarize the available information in a domain in order to prevent individual studies from remaining detached from each other, thus hindering more far-reaching, powerful conclusions (Petticrew & Roberts, 2006). The present systematic review has the primary aim to appraise the effectiveness of cooperative interventions on primary education. Additionally it has the aim to appraise the effectiveness of cooperative learning on different subjects in primary education and the effectiveness of teacher training on cooperative learning on primary pupil's academic achievement.

1. What are the effects of cooperative learning interventions on academic achievement of primary pupils, in comparison to teacher-centered instructional methods?
2. What are the effects of cooperative learning interventions conducted in different subject on primary education?
3. What are the effects of different teacher training programs on cooperative learning on primary pupils' academic achievement?

## **Method**

### **Systematic Review Objective**

The aim of the present systematic review is to assess the effects of cooperative learning interventions in comparison to traditional instructional methods on academic achievement of primary school pupils. Additionally, the review seeks to assess the effects of cooperative learning interventions

within different academic subjects in primary education. Finally, the review aims to investigate the effects of different types of cooperative learning teacher training programs on pupils' academic achievement.

### **Inclusion Criteria**

One of the main characteristics that differentiates a systematic from a narrative reviews is the pre-specified criteria for including and excluding studies in the review (Connor, Green, & Higgins 2008). Eligibility criteria determine in advance the type of studies that most likely answer the research questions (Petticrew & Roberts, 2006). The eligibility criteria for the present systematic review are the following:

1. Studies using experimental or quasi-experimental research designs.
2. Interventions identified as cooperative, collaborative, or group learning.
3. Interventions measuring outcomes in academic achievement.
4. Studies investigating primary school students.
5. Studies published in English no earlier than 1999.

In the present systematic review both experimental and quasi-experimental studies were reviewed. Experimental studies or randomized controlled trials (RCTs) are methodological designs that present the differences between baseline characteristics of participants and the effects of a specific interventions on such characteristics (O'Connor, Green, & Higgins, 2008). Quasi-experimental studies differ from experimental studies; since the selection of participants is not randomized, they present more risk of bias and are less reliable. However, in this study quasi-experimental studies are also taken into account because they provide valuable information about the effects of cooperative learning on pupils' academic achievement. Additionally, only studies written in English from 1999 until 2012 are reviewed, as to narrow the analysis to the last decade.

The participants included in this review are primary or elementary students within the range of 5 to 13 years old. All type of students, including pupils with learning disabilities, are equally taken into account as the idea of the research is to understand the overall effects of cooperative methods on primary students. The types of interventions analyzed are: cooperative, collaborative, or group learning interventions, which aim to enhance academic achievement in any subject area in primary education. The cooperative interventions reviewed: a) assess an academic achievement baseline, b) conduct a cooperative learning intervention, and c) assess academic achievement after the intervention. This method of assessing the effectiveness of cooperative learning interventions has been described by Webb (1997). Furthermore the primary outcome reviewed in this study is academic achievement. Achievement is defined as the level of knowledge or cognitive attainment in a specific domain. Such achievement is

assessed through standardized and unstandardized pre- and post-intervention tests in order to show intervention effectiveness.

### Search Methods for Identification of Studies

Systematic reviews require an objective and also reproducible search methodology that allows the identification of as many relevant studies as possible (Lefebvre, Manheimer, & Glanville, 2008). For the present study, a series of steps were followed in order to retrieve studies that met the eligible criteria. First, a consistent search of studies in Education Resources Information Center (ERIC), Web of Science, and SAGE electronic databases was conducted. All searches of the three mentioned databases used the following keyword: “Cooperative learning” OR “Collaborative learning” OR “Group learning” AND “Primary.” All the studies retrieved were in English, and they were not written prior to 1999.

The titles and the abstracts of the studies were initially screened and a total of 2,228 studies were found in the aforementioned electronic databases, however through title and abstract screening it was possible to dismiss many articles since they evidently did not fulfill the eligibility criteria. A total of 99 studies were identified as relevant through the initial screening and they were retrieved and categorized. Once a first pool of articles was obtained, a full text-screening was conducted in order to further determine whether or not the articles truly fulfilled all the eligibility criteria.

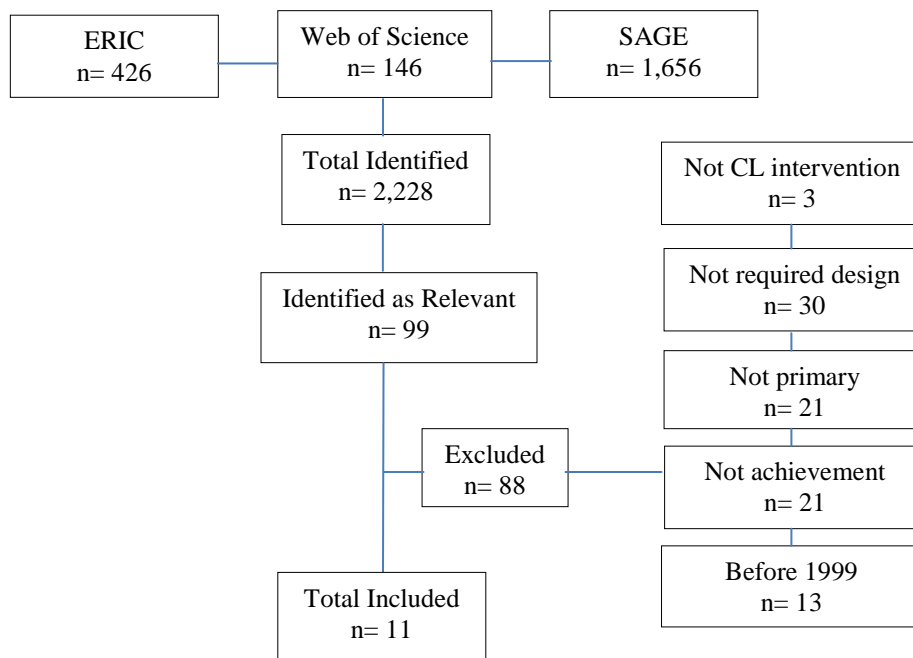


Figure 1. Flowchart of study selection process showing the results of literature search of studies from 1999 to 2012. The literature search took place from January to May 2012.

### **Data Collection and Extraction**

The data in a systematic review is provided by individual studies and it refers to any information that may help to answer the research questions (Higgins & Deeks, 2008). In the present systematic review a specific format was designed to retrieve relevant information from individual studies such as; research design, participant's grade, intervention's comparisons group, intervention's features, achievement outcomes, and domains of interventions. Not all the information provided by individual study was retrieved nor summarized in the format. Rather, it was only the case for the information related to the research questions.

### **Assessment of Risk of Bias**

The extent to which a systematic review can draw conclusions about the effects of an intervention depends on whether or not the data and the included results of the reviewed articles are valid (Higgins & Altman, 2008). Individual studies' results are not always valid due to methodological shortcomings or bias. A key dimension of the studies' appraisal is to examine the quality of the studies' methodology before including them in the review. A "hierarchy of research studies design" can set the standards of research quality. According to this hierarchy, randomized controlled trials (RCTs) are known as the "gold standard," while cohort studies, case control studies, and cross sectional surveys have less credibility (Jesson, Matheson, & Lacey, 2011).

Based on the "hierarchy or research studies design," the present review only includes studies that are either randomized controlled trials or quasi experimental studies, as both research designs reduce risks of bias. Additionally, the present review appraises the quality of the retrieved studies by differentiating the results of randomized controlled trials and quasi experimental studies. The results from randomized controlled trials are considered to have less risks of bias and, consequently, draw more reliable results.

### **Data Analysis and Synthesis**

In order to appraise the effects of cooperative learning interventions on academic achievement, the present study defined a rating criteria based on the "What Works Clearinghouse" (WWC) rating criteria, developed by the Institute of educational Sciences of the U.S Department of Education (2012). The rating criteria are clearly described in the WWC intervention report, "Peer-Assisted Learning/Literacy Strategies" (Appendix A). According to these criteria, studies should be appraised according to a) the research design quality, b) the effectiveness of the intervention, and c) the extent of evidence supporting such effectiveness. The results of the present review are presented through tables,

narrative synthesis of individual studies, and cross-study narrative synthesis, all of which intend to answer the proposed research questions.

## **Results**

A total of 11 studies were found to meet the criteria for inclusion in the review. Appendix B summarizes the characteristics and findings of the studies identified for inclusion. Four studies were randomized controlled trials (RCTs), and seven studies were quasi experimental researches. All the studies analyzed the effects of cooperative, collaborative, or group learning interventions on primary students' achievement. Nine studies compare cooperative interventions with a traditional model of instruction. All together, the studies included a sample of 5,259 pupils, and one study analyzed the effects of cooperative learning intervention on children with learning disabilities (22 pupils).

Results are first presented through a narrative synthesis, which describes each individual study. Afterwards, a cross study analysis based on the defined rating criteria is presented, in order to answer the research questions. Table 1 presents the effect of cooperative interventions on achievement in comparison to traditional instruction. Furthermore, Table 2 presents the effect of cooperative learning interventions on achievement in different subjects. And finally, Table 3 shows the effect of different types of teacher training on primary pupils' achievement.

### **Studies that meet the quality criteria without reservations**

Four studies in the literature search met criteria established in the present thesis without reservation because they were randomized controlled trials (RCTs). In the following section, the participants, interventions, control group characteristics, outcomes, measures, and results of each individual study are described in a narrative synthesis.

Gillies and Ashman (2000) analyzed the effects of training in cooperative learning on verbal comprehension, figural, and quantitative reasoning of primary pupils. The sample included 152 third grade students drawn from 25 classes of 11 schools in Brisbane, Australia. Classes were randomly assigned to a structured cooperative interventions or and control group where some unstructured cooperative work took place. In both conditions participants were allocated into four students' workgroups, and each group included one high-ability, two medium-ability, and one low-ability student. In the structured group, pupils participated in two training session of one hour each, in which they learned about small-group behaviors, group involvement, sharing resources, and providing constructive feedback. After this initial training, pupils worked with their cooperative learning groups one hour per day, three

times per week throughout nine months. Furthermore, pupils worked in groups in their social studies class, and they solved problems that entailed comprehension, analysis, synthesis, and evaluation of the information. In the unstructured group, children received traditional instruction combined with unstructured cooperative work (cooperative learning conducted without proper training). Outcomes were measured through: (a) a comprehension test answered in groups and (b) an individual reading test. Results showed a significant difference between the comprehension post-tests of the structured group in comparison to the unstructured group  $F(1, 20) = 15.36, p < .001$ . However, there were no significant differences between the individual reading post-test scores of both conditions.

In another RCT, Hitchcock, Dimino, Kurki, Wilkins, & Gersten (2011) studied the effect of Collaborative Strategic Reading intervention on student reading comprehension. The sample included 1,355 fifth grade pupils from 74 classrooms in Oklahoma and Texas. The sample was randomly assigned into an experimental group (37 classes, 681 pupils) and into a control group (37 classes, 674 pupils). In the intervention group, teachers rather than pupils received a two-day training session about the theoretical foundations of Collaborative Strategic Reading as well as the practical strategies for integrating this method into social studies lessons, with the aim that they transfer what they learned on the training sessions to their respective classrooms. Additionally, they received further support from researchers to integrate this method into their classes during one academic year. The Collaborative Strategic Reading intervention programs sought to teach pupils a series of comprehension strategies such as: previewing a text to obtain a sense of what will be learned, generating questions for oneself about what the text is attempting to convey, clarifying unclear information, and summarizing main points. Students were assigned to cooperative learning groups of four to six students to work together and practice the reading comprehension strategies. Each student in the group was assigned a role, such as leader or timekeeper. The comparison group did not receive instruction on Collaborative Strategic Reading, and followed a traditional instructional method. Outcomes on reading comprehension were measured using the pre- and post- intervention test, GRADE, which assesses vocabulary and reading comprehension. Results of the study showed that the Collaborative Strategic Reading intervention did not have a statistically significant impact on student reading comprehension.

In a 2011 study Sahin analyzed the effects of the Jigsaw III cooperative learning technique on academic attainment of primary students on written expression. The sample included 71 sixth-grade students from a Turkish primary school, and all students rather than classes, were randomly assigned to an experimental group (36 pupils) and a control group (35 pupils). For five hours a week over a six weeks period, the intervention group received instruction about the Jigsaw III technique and Turkish writing expression. Further, students were divided into groups of six children, and each member of the group had the task of becoming an expert in a topic related to written expression and then to explain it to the rest of

the group. The comparison group received instruction on Turkish written expression through a teacher centered method but not through jigsaw instruction. The outcomes of the intervention were assessed through pre- and post- interventions test (ATTC standardized test). The results showed that the experimental group did significantly better than the control group in terms of written expression.

In a more teacher-oriented direction, Veenman, Denessen, Van den Akker, and Van der Rijt (2005) analyzed the effects of a teacher training program for cooperative learning on students' attitudes toward seeking help, and giving help, and math achievement of primary pupils. In this review only the effects on math attainment are analyzed. The sample was comprised of 48 sixth grade students from eleven to twelve years old. Participants were drawn from seven primary schools in The Netherlands and were randomly assigned to an experimental group (36 pupils) and a control group (12 pupils) to work in dyads. In the intervention group teachers were instructed in a cooperative learning instructional program; this program was based on Johnson and Johnson (1999) "learning together" and Kagan (1994) "structural" approaches. Teachers received ten sessions, each lasting three hours, about the theory of cooperative learning and its practical implementation. Teachers learned how to structure positive interdependence, individual accountability, and social skills. On the other hand, teachers transfer what they learned to their classrooms during one hour a day, three times per week. Teachers in the control group didn't receive training on cooperative learning. Outcomes were measured through pre- and post-intervention math tests, answered by dyads in both the experimental and the control group. Results showed no statistically significant differences between the treatment and control groups.

### **Studies that meet the quality criteria with reservations**

Seven studies in the literature search met the criteria defined for the present thesis with reservation, since they were quasi-experimental studies. The following section describes the participants, interventions, control group features, outcomes, measures, and results of each individual in a narrative synthesis.

To begin, in 2007 Baines, Blatchford and Chowne evaluated the effects of the program, "Spring group work," on primary students achievement in science. The sample included 1,587 pupils, who were not randomly assigned to an experimental group (560 pupils from fourth and fifth grades, from twelve different schools in London) and a control group (1,027 pupils from fourth and fifth-grade classes from nineteen different schools). In the intervention group researchers worked with the teachers in order to help them develop pedagogic principles regarding group-work. Seven meetings within one academic year were conducted. Teachers transferred to their classrooms what they had learned in the training program over a fourteen weeks period. The comparison group, on the other hand, followed a traditional instruction

approach. The outcomes of the intervention were assessed through pre- and post-science tests based on knowledge of evaporation-condensation and forces. Results indicated a significant difference between the intervention and control groups. Namely, pupils in the experimental group obtained statistically significant gains in comparison to the control group.

In a similar 2006 study, Kutnick, Ota, and Berdondini investigated the effects of a group-work intervention on primary pupils' academic attainment of math and reading. The study sample included 980 pupils between five to seven years old, who were assigned to an experimental group (475 pupils) and a control group (505 pupils). The study adopted a quasi-experimental method as assignment to experimental or control was based on the teachers' will to participate in the study. In the intervention group, teachers worked with researchers to learn about group work pedagogy and how to develop group work activities. Afterwards, teachers transferred the learned material to their classrooms by leading activities that promote: trust and support, communication skills, discussions, and socio-emotional consideration. Pupils received group work instructions in three lessons per week during one academic year. In the control group teachers didn't receive support to develop group-work activities and implemented regular teacher-center classes which may occasionally include group work activities. Academic outcomes in math and reading were assessed using pre- and post-standardized test, Performance Indicators in Primary Schools (PIPS), which covers curriculum-related areas of reading, vocabulary, and mathematics. Results on reading achievement showed that experimental classes gained more than control classes while analyses of mathematics showed that experimental classes gained *significantly* more than control classes.

Marinopoulos and Stavridou (2002) studied the effects of collaborative learning instruction on primary students' achievement on science in comparison to traditional instruction. The sample included 329 fifth and sixth grade students from eleven to twelve years old. The sample was drawn from seven primary schools in Greece. One hundred and twenty eight students and six teachers volunteered to participate in the experimental group while 101 students and five teachers volunteered to be part of the control group. In the intervention group, students received ten sessions of one hour each, about gases, air pollution and acid rain. Students worked collaboratively in small groups of three to five students, and within these groups students expressed personal ideas about the phenomenon, talked with other members about the assigned topics, and drew conclusions together. In the control group students were instructed through traditional teachers' lectures, and no collaborative work was conducted. Outcomes of the intervention were assessed through pre- and post-tests regarding science concepts. Results indicated that after the intervention the experimental group increased substantially their academic achievement (no overall significant effects were reported), in comparison to the control group.



Further building on this comparison, Peklaj and Vodopivec (1999) investigated the effects of cooperative versus individual learning on students' cognitive achievement. The sample included 373 fifth grade students from eleven years old, and 28 teachers. The sample was drawn from nine primary schools in Slovenia that volunteered to participate in the study. One hundred and seventy students were assigned, not completely randomly, to the experimental group and 203 students were assigned to the control group. In the intervention group teachers received training in three sessions of eight hours each about methods of cooperative learning (e.g. group project, group discussion, cooperative cards, investigation circle, Jigsaw) as well as methods to enhance group interdependence, individual accountability, and cooperative social skills in the classrooms. Teachers adopted cooperative methods in one of four lessons per week in math and also in Slovene language. In the control group students were instructed in both subjects in traditional (individualistic) ways. The cognitive outcomes of this quasi experimental study were assessed through two mathematics tests and two tests of Slovene language. These tests were equally applied to the experimental and control groups. Results showed that the cooperative learning group achieved greater gains in both mathematics ( $F(1,350) = 10.72, p < .001$ ) and Slovenian Language tests ( $F(1,331) = 39.23; p < .001$ ).

In another quasi-experiment, Thurston, Christie, Howe, Tolmie, and Topping (2008) analyzed the effects of a teacher training program (CPD) based on collaborative group work instruction on primary students' achievement in science. The sample included 332 pupils from 24 Schools in Scotland. In the intervention group, teachers received instruction on pedagogical approaches to enhance effective group work. The CPD training program took place over three days in one academic year, and it was based on Harland and Kinder approach (1997). The program aimed to enhance the teachers' ability to develop students' group-work skills; these skills included: offering explanations, disagreeing with partners, making suggestions, and asking open questions. Teachers were meant to transfer what they learned to their classroom within one year period. There was no control group in this study and comparisons about the intervention effectiveness were based on pre and post-achievement tests. Measures of standard attainment in science were gathered through the PIPS standardized test. Results showed that the CPD collaborative intervention had a statistically significant positive effect on pupils science achievement ( $F = 55.19$ , degrees of freedom (df) = (1, 331),  $p < 0.0001$ ).

A study by Thurston, Duran, Cunningham, Blanch and Topping (2009), investigated the effects of an online peer tutoring intervention on first and second language achievements (reading attainment and writing fluency), in comparison to a traditional teacher centered class. The sample included 85 pupils between nine and twelve years old, and the sample was drawn from two schools, one in Spain and the other in Scotland. In this quasi-experimental study, 33 pupils were assigned to experimental group and 52 to the control group. In the experimental group pupils were paired across countries through internet.

Students were paired based on similar abilities in the second language and received the instruction to write messages in the language they were learning and correct messages in their native languages. Therefore, each student assumed both the role of tutor and tutee in different activities. The intervention took four hours per week during eight weeks. The control group received normal Spanish/English curriculum tutoring by a teacher. Outcomes on language achievement were measured through standardized Spanish and English tests. Results showed that the Scottish experimental group, in comparison to the control group, gained significantly from pre- to post-test in their second language attainment ( $F(1,41) = 19.75, p < .001$ ). However, differences in gains were not significant in their own language tests. Spanish experimental pupils gained significantly more than the control pupils in their own language attainment ( $F(1,40) = 47.38, p < 0.0001$ ). However, the Spanish experimental group showed no significant achievement in English post-test when compared to the control group.

Meanwhile, Topping and Trickey (2007) studied the long term effects of collaborative intervention on cognitive attainment. The sample included 148 fifth-grade students from nineteen schools in Scotland. The sample was divided into experimental (96 pupils) and control groups (52 pupils) in a non-randomized way. The intervention group received instruction on collaborative philosophical inquiry by a trained teacher one hour per week over a six month period. Each lesson included the following steps: (a) an exercise to promote attention, (b) an exercise to remember the last session, (c) a story read aloud by the teacher, (d) a dyad work to check initial understanding of the story, (e) a dialogue in groups of six children – to encourage pupils to: communicate, support their points of view with reasons, listen to each other, and construct a deeper and mutual understanding, (f) closure, and (g) homework. In the comparison group the children received a traditional classroom instruction, which was unrelated to the collaborative philosophical inquiry intervention. The outcomes of the intervention were assessed through pre- and post-tests, using the updated version of the test CAT3. Results showed that pupils in the intervention group had significant gains in achievement, while children in the control group did not ( $F(1, 104) = 69.274, p < .001$ )

### **Effect of Cooperative Learning Intervention on Achievement, Compared to Traditional Instruction**

Four retrieved studies were randomly controlled trials (RCTs), and three of these studies compared cooperative learning with traditional instructional methods (Sahin, 2011; Hitchcock et al., 2011; Veenman et al., 2005). One randomized controlled trial (Gillies & Ashman, 2000), compared the cooperative intervention with an unstructured intervention not a control group; therefore, it was not included in this analysis. Together, the three aforementioned studies included 3,301 primary pupils. Results of two of the studies (Hitchcock et al., 2011; Veenman et al., 2005) showed that cooperative or collaborative learning interventions had no significant effects on individual academic achievement, and

only one study showed (Sahin, 2011) that the cooperative intervention (Jigsaw method) had significant effects on individual achievement.

Seven studies were quasi-experimental, but only six of these (Baines et al., 2011; Marinopoulos & Stavridou, 2002; Kutnick et al., 2006; Peklaj & Vodopivec, 1999; Thurston et al., 2009; Topping and Trickey, 2007) compared cooperative learning with traditional instructional methods. Together, these six studies included 1,869 primary pupils. Three studies showed that cooperative interventions had significant effects on achievement in comparison to traditional instruction groups (Baines et al., 2011; Peklaj & Vodopivec, 1999; Topping & Trickey, 2007). One study (Marinopoulos & Stavridou, 2002) suggested that the intervention had a substantial positive effects but it is not clear whether or not the effects are significant. Two studies found both significant and non-significant effects on different aspects of the intervention (Kutnick et al., 2006; Thurston et al., 2009). None of the quasi experimental studies showed statistically significant negative effects on pupils' academic achievement.

Table 1 shows that the effectiveness of the cooperative learning is considered to be *positive* based on the formulated criteria of the present thesis. Results showed that there was more than one study with statistically significant positive effects and one of those was a RCT. Furthermore, there were no studies that showed statistically negative effects of cooperative interventions on pupil's academic achievement. Consequently the effectiveness of cooperative learning interventions on primary education is considered to be positive in comparison to teacher centered instruction. Additionally the extent of the evidence is considered to be medium to large according to the pre-established criteria of the present thesis.

Table 1

*Effect of Cooperative Interventions on Achievement in Comparison to Traditional Instruction*

Outcome	Studies Rating	Participants	Intervention effectiveness	Evidence
academic achievement	3 RCTs and 6 quasi experimental studies.	4,775	Positive effects	Medium to large

**Effects of Cooperative Interventions on Different Subjects in Primary Education**

Three studies (Baines et al., 2011; Marinopoulos & Stavridou, 2002; Thurston et al., 2008) investigated the effects of cooperative learning interventions on science achievement through quasi-experimental studies. Two studies (Baines et al., 2011; Thurston et al., 2008) found significant effects of cooperative interventions on science achievement in comparison to traditional instruction. One study (Marinopoulos & Stavridou, 2002) found substantially positive effects, but no significance was reported.

None of the above studies is a randomized controlled trial (RCT). Consequently, the effectiveness of the intervention is rated as potentially positive.

Five studies (Sahin, 2011; Hitchcock et al., 2011; Kutnick et al., 2006; Peklaj & Vodopivec, 1999; Thurston et al., 2009) analyzed the effects of cooperative interventions on language attainment. Within the subject of language attainment, reading, writing, and verbal achievements were taken into account. One RCT study (Sahin, 2011), which analyzed the effect of the Jigsaw method on writing achievement of primary pupils found significant effects on the intervention group in comparison to the control group. However a second RCT study (Hitchcock et al., 2011), which analyzed the effect of the Collaborative Strategic Reading (CSR) intervention on 1,355 student reading comprehension, found that there was no statistically significant difference among the control and intervention group. The remaining three studies were quasi-experimental. One quasi-experimental studies found significant effects of the cooperative intervention on language attainment (Peklaj & Vodopivec, 1999) and two studies ((Kutnick et al., 2006, Thurston, 2009) found both significant and non-significant intervention effects. The effectiveness of the cooperative interventions on language attainment is rated as positive due to the significant results found in one RCT study, and no significantly negative effects were found in any study.

Three studies (Kutnick et al., 2006; Peklaj & Vodopivec, 1999; Veenman et al., 2005) analyzed the effects of cooperative interventions on pupil's mathematical achievement. One study was a RCT (Veenman et al., 2005) and analyzed the effects of a training program in cooperative learning on academic achievement in comparison to a traditional classroom. The results of the study show that there were no significant difference between the experimental and the control group. The two remaining studies were quasi-experimental (Kutnick et al., 2006; Peklaj & Vodopivec, 1999), and both found significant gains in mathematical achievement in the intervention groups. The effectiveness of the cooperative interventions on math achievement is considered to be potentially positive according to the defined rating criteria.

Two studies investigated the effects of cooperative learning on pupil's cognitive attainment (Gillies & Ashman, 2000; Topping & Trickey, 2007). One study (Gillies & Ashman, 2000) analyzed the effects of a cooperative intervention on group and individual cognitive achievement, in comparison to an unstructured group. The study included students with learning disabilities who worked students with medium and high abilities. Results of this study showed significant positive effects of the intervention on group attainment but not on individual attainment. The second study (Topping & Trickey, 2007) was quasi-experimental and studied the effects of a collaborative philosophical inquiry intervention on pupils' attainment. Results showed significant gains for the intervention group. The effectiveness of the cooperative interventions on cognitive attainment is potentially positive according to pre-established rating criteria.

Table 2 shows the results regarding the effectiveness of cooperative interventions in different subjects in primary education according to the pre-established criteria. Cooperative interventions on language are appraised as the most effective ones since there is a RCT study with positive effects more than two studies showing significant effects, and none showing negative effects. Cooperative learning interventions in the other subjects analyzed such as science, math, and cognitive attainment were appraised as potentially positive since there were no RCT with positive effects that confirm a definite, positive effects. The extent of the evidence was considered to be medium to large in all subjects except cognitive attainment, in which there were only 300 pupils analyzed.

Table 2

*Effect of Cooperative Learning Interventions on Achievement in Different Subjects in Primary*

Outcome Domain	Studies rating	Participants	Intervention effectiveness	Extent of evidence
Science	3 quasi experimental studies	2,047	Potentially positive effects	Medium to large
Language	2 RCTs studies and 3 quasi experimental	2,864	Positive effects	Medium to large
Math	1 RCT study and 2 quasi experimental	1,401	Potentially positive effects	Medium to large
Cognitive attainment	1 RCT study and 1 quasi experimental	300	Potentially positive effects	Small

### **Effects of Teachers Training on Cooperative Methods on Primary Pupils' Achievement**

Six of the retrieved studies (Hitchcock et al., 2011; Veenman et al., 2005; Baines et al., 2011; Kutnick et al., 2006; Peklaj & Vodopivec, 1999; Topping & Trickey, 2007) described the effects of training teachers in cooperative, collaborative or group learning methods on pupils' academic attainment. Such effects were analyzed in comparison to control groups, in which teachers received no training on cooperative methods.

The first two studies (Peklaj & Vodopivec, 1999; Veenman et al., 2005) based their teacher training program on general cooperative learning principles such as: positive interdependence, individual accountability, peers interaction, and development of interpersonal and group skills, as described by Johnsons and Johnson (1994). Together, the studies analyzed a sample of 421 pupils. One quasi-experimental study (Peklaj & Vodopivec, 1999) found significant effects of the cooperative teacher training program on pupil's academic achievement. However, the second study (Veenman et al., 2005),

which was a RCT, found no significant differences in achievement of students who were instructed by trained teachers and those who were instructed by teachers who did not receive training. The effectiveness of teacher training program is considered to be potentially positive according to the standards defined in the methodology of the present thesis. Such a conclusion is drawn because there were no RCT studies with positive effects, at least one study show statistically significant effects, and no study show negative effects of teacher training on students' achievement.

The next two studies (Baines et al., 2011; Kutnick et al., 2006) involved a teacher training programs based on group learning pedagogies, which are founded in enhancing pupils' trust, support, communication skills, partnered discussions, and socio-emotional consideration. Group learning training principle are similar to cooperative learning principles described by Johnson and Johnson (1994); however, Baines et al. (2011) and Kutnick et al. (2006) refer in the study to "group learning" programs instead of cooperative programs; therefore, such a distinction is made in the analysis of this specific question. Together the studies included a sample of 2,567 pupils. Both studies were quasi-experimental, and one study (Baines et al., 2011) found significant effects of the training program on students' achievement. The second study (Kutnick et al., 2006) found both significant and non-significant effects of the intervention on different domains of academic achievement. The effectiveness of the intervention is appraised as potentially positive, as there was no RCT, one study with significant effect, and no study reporting negative effects.

The final two studies (Hitchcock et al., 2011; Topping & Trickey, 2007) trained teachers in programs that enhanced cooperative, collaborative, and group work; however, the programs have a different denomination. Hitchcock et al. (2011) trained teachers in the program, "collaborative strategic reading." This program enhances both principles of cooperative learning and principles of reading comprehension. On the other hand, Topping and Trickey (2007) trained teachers on a methodology called "collaborative philosophical inquiry," which trained teachers in the development of focusing exercises, reading activities, dyads and group work. Together, the studies included a sample of 1,503 pupils. One study was a RCT (Hitchcock et al., 2011) and found no significant results between the achievement of students with trained teachers and the achievement of students with teachers who did not receive training. The second study (Topping & Trickey, 2007), which was a quasi-experimental, found a significant difference between the achievement of students taught by trained teachers and achievement of students taught by untrained teachers. The effectiveness of the teacher training programs on RCT and philosophical inquiry was appraised as potentially positive.

Table 3 shows the appraisal of the effectiveness of the different types of training program programs for cooperative methods. All the training programs were appraised as potentially positive. This was due to the fact that there was no RCT that proved the complete positive effectiveness, but there were

also no negative effects. The extent of the evidence was considered to be medium to large for all training programs.

Table 3  
*Effect of Different Types of Teacher Training on Primary Pupils' Achievement*

Outcome domain	Studies rating	Participants	Intervention effectiveness	Extent of evidence
Training on cooperative learning	1 RCT and 1 quasi experimental	421	Potentially positive effects	Medium to large
Training on Group learning	2 quasi experimental	1,587	Potentially positive effects	Medium to large
Training on others methods	1 RCT and 1 quasi experimental	1,503	Potentially positive effects	Medium to large

## Discussion

Eleven studies which examined the effectiveness of cooperative interventions on primary students' academic achievement were identified and analyzed. Four studies followed a randomized control design and the remaining seven followed a quasi-experimental design. Together, the studies included a sample of 5,259 pupils. Nine studies compared the effectiveness of cooperative learning interventions to traditional, teacher center instruction. Furthermore, three studies analyzed the effects of cooperative learning on primary pupils' science achievement, four studies analyzed the effects on language attainment, three analyzed the effects of cooperative learning on math, and two analyzed the effects on cognitive attainment. Only one of the retrieved studies analyzed the effects of cooperative interventions on academic achievement of primary pupils with learning disabilities.

The effectiveness of the cooperative, collaborative and group interventions analyzed in this systematic review was determined through the WWC rating criteria described by the U.S department of education (2012). Based on these criteria the results of the quasi-experimental studies and the randomized controlled studies were differentiated, and the RCTs results were considered to be more reliable. The effectiveness of cooperative interventions was assessed in comparison to traditional instructional methods and in different academic subject. Similarly, the effectiveness of teacher training programs on cooperative learning was also appraised by analyzing the positive, negative, or undermined statistical significance of

the intervention effects. The extent of the evidence was evaluated by accounting for the number of participants included in the studies as well as the amount of studies found.

### **Effectiveness of Cooperative Learning in Primary Education**

Results of nine studies assessing the effects of cooperative learning on pupils' academic achievement in comparison to traditional methods showed that the effectiveness of the cooperative learning was positive. This conclusion was based on the fact that one randomized control study and three quasi-experimental studies showed statistically significant positive effects of cooperative learning interventions on primary pupil's academic achievement while no negative effects were found. Since past research (e.g. Kutnick, Ota & Berdondini, 2006) has pointed out that primary pupils may not have the competencies to take full advantage of cooperative learning interventions, one of the main purposes of the present systematic review was to analyze whether cooperative methods are effective at enhancing academic achievement in primary education. The analysis of the nine studies demonstrate the positive effects that cooperative interventions has on primary pupils academic achievement, suggesting that even the younger pupils benefit from interventions that promote social interaction, group work, learning goals interdependence, and individual accountability, such as cooperative learning.

However, it is relevant to mention that even though the overall appraisal of cooperative interventions was positive, some studies (e.g. Hitchcock et al., 2011; Veenman et al., 2005) showed no differences between cooperative interventions and traditional instruction. Variability of the results can be better understood by analyzing the factors that mediate the effectiveness of interventions. Slavin (1983), for example, has suggested that cooperative incentives or group rewards are a determining factor in the successful implementation of cooperative learning interventions. Johnson and Johnson (1994) have suggested that it is the appropriate implementation of: positive interdependence, individual accountability, and group skills, that determines the effectiveness of a cooperative intervention. Furthermore, Cohen (1994) has suggested that it is, in fact, the nature of the interactions that mediates the variability of cooperative learning effectiveness. The present study showed that cooperative learning has positive effects in primary education, however future research should explore the factors that mediate the intervention effectiveness.

### **Effectiveness of Cooperative Learning Effects on Different Subjects**

In the present systematic review, results regarding the effectiveness of cooperative interventions in different academic subjects showed that, according the criteria used, only cooperative interventions on language were appraised as positive. More specifically, one randomized control study and one quasi-



experimental studies showed statistically significant positive effects of a cooperative learning intervention on language attainment, and no negative effects were found. Results also showed that cooperative interventions on science, math, and cognitive attainment were potentially positive, since there are quasi experimental studies that support such results but no statistically significant RCTs.

Lou et al. (1996) conducted a meta-analysis on the effectiveness of group learning on academic achievement in different academic subjects and educational levels and found that the effects of group learning were significantly larger in math and science than in reading, language, arts, and other courses. Lou et al. (1996) suggest that the larger effects on math and science could be related to the different nature of learning tasks involved in such subjects, which, according to the authors, are more complex and require specific assistance of peers. The aforementioned meta-analysis included participants from different educational levels, and results differ to a certain extent from the results found in the present study. Namely, the present study found that cooperative intervention had more positive effects on language. Given the different results, it is possible that cooperative interventions may have higher effects in certain subjects only at specific academic levels. As Lou et al. (1996) mentioned math and science can be considered complex subjects; consequently, it is also possible that primary pupils may benefit more in these subjects from teacher instruction than from group work. However, language may be a subject in which primary pupils can learn more efficiently through cooperative learning instruction, since this methodology gives pupils the opportunity to verbalize their individual knowledge. In turn, this may lead to higher cognitive elaboration, deeper reflections, awareness of individual knowledge and misconceptions, and expansion of knowledge (Van Boxtel, 2000).

An example of a specific cooperative learning program that enhances primary pupil's achievement in language is "Peer assisted learning strategies" (PALS). PALS is a specific educational program that takes into account cooperative and collaborative learning principles in order to enhance language development on primary pupils. The program seeks to enhance reading accuracy, fluency, and comprehension by promoting pair work in primary education. Stein et al. (2008) found statistically significant positive differences between the intervention group and the control group which followed a traditional instruction, in alphabetic domain. PALS is an specific example of a cooperative learning program that enhance academic achievement in Primary in the academic subject of Language. It will be relevant to research whether there are more cooperative learning programs in subjects such as math or science in order to study the extent of their effectiveness on primary pupil's academic achievement.

Although the results of the present study show positive effects of cooperative learning on primary pupils language achievement and the potentially positive effects on science and math, the number of

studies found in the present systematic review is scarce, which limits the impact of the results. A greater amount of studies in science, math, and language that follow RCTs and quasi-experimental designed are required to give more reliable appraisals of the effectiveness of cooperative learning on such subjects. Additionally, no studies regarding the effects of cooperative learning on subjects such as music, arts, and physical education on primary pupils were found. It could be relevant to understand whether cooperative learning can have an impact in wider range of subjects in primary education.

### **Effectiveness of Teacher Training on Pupils' Achievement**

The present thesis conducted a systematic review to analyze the effects of cooperative learning on primary student's academic achievement. Five studies analyzed the effects of directly instructing primary pupils on cooperative learning and assessing the academic achievement of pupils after the cooperative learning intervention. Six studies analyzed the effects of training teachers in cooperative methods on pupils' academic attainment. Both types of studies analyzed the effects of cooperative learning on primary pupil's achievement, however the first five studies focused on pupils training and the remaining six studies focused on teacher training and its effects on pupils achievement.

From the six studies that analyzed the effects of training teachers on cooperative learning, two involved a teacher training program based on cooperative learning principles described by Johnson and Johnson (1994). Another two studies based their teacher training programs on group learning pedagogies, which enhance pupils trust, support, communication skills, partnered discussions, and socio-emotional consideration. The two remaining studies involved teacher training programs grounded in cooperative and collaborative principles, which had the specific denomination and methodologies: "collaborative strategic reading" and "collaborative philosophical inquiry."

Results regarding the effects of the different teacher training programs on primary pupil's academic achievement showed that all training programs had potentially positive effects; however, none had complete positive effects, as there were no RCTs with statistically significant positive effects. According to Johnson and Johnson (1994), teachers must understand the theoretical background underlying cooperative learning principles in order to develop a structured, cooperative instruction that enhances positive effects on pupils learning. Concerns regarding the way in which teachers implement cooperative learning in everyday classes have suggested that special attention must be paid to the training that teachers receive in cooperative learning instruction (Veenman et al., 2002). Research has suggested that the extent of training given to teachers on cooperative learning instruction significantly moderates the effectiveness of cooperative learning interventions (Lou et al., 1996; Veenman et al., 2002).

Research has supported the positive effects that teacher training programs in cooperative learning have on pupils' achievement, and, furthermore, the results of the present study have determined that teacher training is potentially positive. However, the programs analyzed in this study varied in duration and methodological approaches. Consequently, a larger sample of studies regarding the effectiveness of teachers training programs exclusively on primary education is required in order to draw more solid conclusions regarding this topic.

### **Study Limitations**

One limitation of the present study is related to the scarce amount of studies found. This issue may be the consequence of the high standards of inclusion and exclusion criterion set for this study. The present review researched three electronic databases: ERIC, Web of Science and SAGE, introducing the following keyword combinations: "Cooperative learning" OR "Collaborative learning" OR "Group learning" AND "Primary." However, it is possible that more studies assessing the effects of cooperative learning on primary pupils could be found either in other databases or by following different combinations of keywords.

A controversial concern for systematic reviewers, according to Petticrew and Roberts (2006), is whether or not, it is appropriate to combine the findings of research studies using methods that differ from one another. The present systematic review appraises studies which assessed the effectiveness of cooperative, collaborative, and group interventions. All these interventions assess a type of instruction based on the promotion of small groups in which everyone is allowed to participate on clearly defined, collective tasks (Cohen, 1994). Each intervention varies in its duration, training methods, and results assessment, among other factors. Moreover interventions varied in the target of training, some cooperative intervention focused on pupils training on cooperative learning, while others focused on teachers training on cooperative learning, but all of them assess the effects of cooperative learning on primary pupil's academic achievement. This variability of interventions introduces a potential bias into the research, however, the aim of the present systematic review was to investigate the types and the amounts of cooperative learning interventions in primary education conducted in the last decade. The hope is to have an overview of the general effectiveness of this instructional method. This systematic review is simply the first appraisal of the available literature on the topic, but further efforts are required to both include more studies as well as to study the effects of very specific interventions and methods.

## **Future Directions**

The present systematic review provided information regarding: (a) the positive effects of cooperative learning interventions on primary pupils' academic achievement, in comparison to traditional methods, (b) the effectiveness of cooperative methods on language in primary education, and (c) the potentially positive effects of teacher training in cooperative methods on primary pupils' academic achievement.

However, further research in different electronic databases as the ones reviewed in this study should be conducted in order to find more experimental and quasi-experimental studies that analyzed the effectiveness of cooperative instruction on primary pupil's achievement. As more studies begin to surface in the future, a meta-analysis investigating the magnitude of the effect sizes of cooperative interventions should be conducted. A meta-analysis about the effectiveness of cooperative learning in primary education exclusively can provide valuable information regarding the proper way to implement this successful instructional methodology in primary education.

Appendix A  
WWC Rating Criteria

**Criteria used to determine the rating of a study**

Study Rating	Criteria
Meets WWC Standards without Reservations	Randomized Control Trial
Meets WWC Standards with Reservations	Quasi-experimental Research

**Criteria used to determine the rating of effectiveness for an intervention**

Rating of Effectiveness	Criteria
Positive Effects	Two or more studies with statistically significant positive effects, at least one study meets WWC standards of strong design, and no study shows statistically significant negative effects.
Potentially Positive Effects	At least one study shows statistically significant positive effects, and no study shows statistically significant negative effects.
Mixed Effects	At least one study shows statistically significant positive effects, and at least one study shows statistically significant negative effects, OR at least one study shows statistically significant positive effects, and more studies show an indeterminate effect.
Negative Effects	Two or more studies show statistically significant negative effects, at least one study meets WWC standards of strong design, and no study shows statistically significant positive effects.
No Discernible Effects	None of the studies show statistically significant effects, either positive or negative.

**Criteria used to determine the extent of evidence of an intervention**

Extent of Evidence	Criteria
Medium to Large	The domain includes more than one study and more than one school, and the domain findings are based on a total sample size of at least 350 students.
Small	The domain includes only one study or only one school, or the domain findings are based on a total sample size of fewer than 350 students.

Note. Adapted from “Peer-Assisted Learning/Literacy Strategies” by U.S Department of Education, Institute of education Sciences, p.22. 2012.

## Appendix B

## Data Collection Form: Summary of Individual Studies Main Findings

Study	Population	Quality - Design	Subject	Intervention	Outcomes	Comparison
Baines, Blatchford & Chowne.	1587 pupils from fourth and fifth grade; 8 to 10 years old.	Quasi-experimental	Science	Researchers worked with teachers of the experimental group to help them develop pedagogic principles about group-work. Seven meetings within one year were conducted. Teachers implemented what they had learned over the course of 14 weeks.	Results indicated a significant difference between the intervention and control groups. Pupils in the experimental group obtained scores 0.2 standard deviations higher than the control group.	Control group which received traditional instruction.
Gillies & Ashman.	152 third grade students. 22 students with learning disabilities	Randomized controlled trial.	Social studies (cognitive attainment: verbal comprehension, figural and quantitative reasoning)	Pupils participated in 2 training session (1 hour each) in which they learned about small-group behaviors, group involvement, sharing resources and information, and providing constructive feedback (based on Johnson & Holubec (1990) approach). Afterwards pupils worked with their cooperative learning groups 1 hour per day, 3 times per week during 9 months, solving problems that entailed comprehension, analysis, synthesis, and evaluation of information.	Results showed that there was a significant difference between the comprehension post-tests of the structured group in comparison to the unstructured group $F(1, 20) = 15.36, p < .001$ . However there were no significant differences between the individual reading post-test scores of both conditions	Unstructured group that worked in cooperative groups but did not receive training on it.
Hitchcock et al.	1,355 fifth grade pupils	Randomized controlled trial.	Reading comprehension	In the intervention group teachers received a two-day training session about Collaborative Strategic Reading theoretical foundations and practical strategies to integrate this method into social studies lessons. No collaborative tasks are described.	Results of the study showed that CSR group did not have a statistically significant impact on student reading comprehension.	Control group which received traditional instruction.

Kutnick, Ota & Berdondini.	980 pupils from 1st and 2nd grade, between 5 to 7 years old	Quasi-experimental	Math and reading	Experimental teachers developed group-work activities to enhance pupils trust and support, communication skills, partnered discussions, and socio-emotional consideration. Teachers also integrated group-working activities into regular curriculum subjects within three lessons per week.	Reading scores showed: (a) increased attainment for all pupils, (b) experimental classes gaining more than control classes. Analyses of mathematics scores showed: (a) increased attainment for all pupils, (b) experimental classes gaining much more significantly than control classes in Year 2 (no significant difference at Year 1).	Control group, which received traditional instruction.
Marinopoulos & Stavridou.	128 fifth and sixth grade students from 11 to 12 years old.	Quasi-experimental	Science	Students received 10 sessions of one hour each about gases, air pollution and acid rain. Students worked collaboratively in groups of 3 to 5 students and exposed personal ideas, talked with other members about the assigned topics, and drew conclusions together. (No further description of the collaborative method.	Results showed that after the intervention the experimental group increased substantially their test gains (no overall effects reported), in comparison to the control group.	Control group, which received traditional instruction.
Peklaj & Vodopivec.	373 fifth grade students	Quasi-experimental	Achievement in Math and Slovene Language.	Teachers received training in 3 session of 8 hours each on cooperative learning methods (e.g. group project, group discussion, cooperative cards, investigation circle, Jigsaw) Teachers also learned to enhance group interdependence, individual accountability and cooperative social skills. Teachers adopted cooperative methods in one of four lessons per week in math and Slovene language.	Results showed that the cooperative learning group achieved greater gains in both mathematics ( $F(1,350)=10.72$ , $p<.001$ ) and Slovenian ( $F(1,331)=39.23$ ; $p<.001$ ).	Control group, which received traditional instruction.

Sahin, A.	71 sixth-grade students (considered primary in Turkey)	Randomized controlled trials.	Written expression (Turkish)	Experimental and control groups were instructed in Turkish writing expression 5 hours a week for 6 weeks. Experimental group was divided into 6 children groups that learned through the Jigsaw III technique.	Results showed that the arithmetic mean of posttest scores of the students in the Jigsaw group was 23.50 and 21.74 in for the control group. The difference in post-tests scores proved to be significant (3.638, $p < 0.05$ ).	Control group which received traditional instruction..
Thurston, Christie, Howe, Tolmie & Topping.	332 pupils from 9 to 12 years old and 24 teachers	Quasi-experimental. With pre- and post-intervention tests. No control groups	Science	It took one academic year and encompassed 3 sessions. It was meant to enhance teachers' ability to develop group work skills in pupils. It was assessed through students' academic achievement, and interaction as well as teacher training approval.	Positive gains on science achievement were statistically significant ( $F = 55.19$ , degrees of freedom ( $df = 1, 331$ ), $p < 0.0001$ ).	No control group. Just pre- and post-intervention tests.
Thurston, Duran, Cunningham, Blanch & Topping.	85 pupils from 4th and 5th grade, between 9 and 12 years old.	Quasi-experimental	Second language achievement (Spanish or English)	In the experimental group pupils were paired across countries through online bases and received the instruction to write messages in the language they were learning and correct messages in their native languages. Each student assumed both the role of tutor and tutee in different activities. They exchanged corrections and explanations. The intervention took place 4 hours per week during 8 weeks.	Scottish experimental group showed significant gains, in comparison to control group in second language attainment ( $F (1,41) = 19.75$ , $p < .001$ ). Differences in gains were no significant in own language tests. Spanish experimental pupils showed significant gains in own language reading comprehension scores ( $F (1,40) = 47.38$ , $p < 0.0001$ ). However they did not show significant advantage in English post test scores.	Control group, which received traditional instruction.



Topping & Trickey.	5th grade students. 96 experimental subjects. 52 control subjects	Quasi-experimental. Control group had traditional classes	Philosophical inquiry. Cognitive attainment	Experimental group teachers were exposed to collaborative philosophical inquiry intervention once per week for six months. A trained teacher transfer the training into class interventions which encompass ; (1) focusing exercise, (2) linking activity, (3) stimulus – read story, (4) pair work, (5) dialogue in groups of about six children, (6) closure, and (7) provide homework.	Children in the intervention group showed significant CAT gains, while controls did not (F(1, 104) = 69.274, p<.001, $\eta^2$ = .449).	Control group, which received traditional instruction.
Veenman, Denessen, Akker & Rijt.	48 6th grade students	Empirical research randomized	Math dyads achievement	Teachers were instructed in a program based on Johnson & Johnson (1999) and Kagan (1994). Teachers learned during 10 sessions within two years about the theory of cooperative learning and its practical implementation. Teachers learned how to structure positive interdependence, individual accountability, and social skills. Pupils received cooperative learning instruction 1 hour a day 3 times per week.	No statistically significant differences between the treatment and control groups were found.	Control group, which received traditional instruction..

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