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Effects of Cooperative Learning on the Academic Achievement of Students with Learning Disabilities: An Update of Tateyama-Sniezek's Review

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This article reviews research published from 1990 to 2000 examining effects of cooperative learning strategies on the academic achievement of students with learning disabilities. The literature search is described. Fifteen studies are included in the review and are grouped according to the types of cooperative learning strategies that were examined. Sample characteristics, measures, findings, and effect sizes are reported in a table. Achievement outcomes are mixed. Cooperative learning strategies that incorporate individual accountability and group rewards are more likely to improve achievement of students with disabilities. However, design problems across the studies limit conclusions to be drawn about the efficacy of cooperative learning. More research is needed before it may be viewed as an effective strategy for students with disabilities.

As part of the 1997 reauthorization process, the Individuals with Disabilities Education Act (IDEA; U.S. Department of Education, 1997) was modified to stipulate that students with disabilities must have access to the general education curriculum. This modification encouraged many states to establish standards of knowledge and skill for all students, including those with disabilities, and to hold teachers accountable for academic outcomes of students with disabilities (Yell & Shriner, 1997). IDEA's requirement that students with disabilities must have access to the general education curriculum has also contributed to an increase in the number of students with disabilities served in regular classrooms.

Of all the disability groups, students with learning disabilities (LD) are the most likely to be placed in regular classrooms. In 1994–1995, 1.25 million students with LD were included in regular classrooms, representing almost half of all school-aged students with disabilities served in regular classrooms (U.S. Department of Education, 1997). Many teachers in both regular and special education classrooms ask how they can accommodate the diverse instructional needs of students with LD, while at the same time help all students meet increasingly rigorous state standards (Mastropieri & Scruggs, 1997; Vaughn, Gersten, & Chard, 2000).

The search for instructional strategies to help teachers improve the academic performance of students with LD is a prominent theme in the current literature. One recommended strategy is cooperative learning (e.g., Goor & Schwenn, 1993; Johnson & Johnson, 1986; Malmgren, 1998; Margolis & Freund, 1991). Cooperative learning (CL) is an instructional method that makes use of small, heterogeneous groups of students who work together to achieve common learning goals (Johnson & Johnson, 1992). Students are often assigned roles for completing tasks in CL groups. The group's ultimate responsibility is to ensure that all members learn assigned material. CL objectives may range from solving common problems to learning specific content (Johnson & Johnson, 1992), and may include a variety of activities (e.g., completing worksheets, writing reports, or solving math problems).

The recommendation to use CL with students with LD is at least partly based on literally hundreds of studies of CL's effects on student achievement. Positive academic and social outcomes have been reported for students in every major subject area, at all grade levels, and in many different types of schools worldwide, prompting Slavin (1996) to pronounce CL to be "one of the greatest success stories in the history of educational research" (p. 43). Proponents of using CL with students with disabilities add that it provides an attractive alternative to ability grouping and competitive environments (e.g., Johnson & Johnson, 1986; Putnam et al., 1996), increases instructional time and enables teachers to individualize instruction (Malmgren, 1998), decreases behavior problems (Margolis & Freund, 1991), and improves nondisabled children's acceptance of students with disabilities (Slavin, 1991).

In spite of general enthusiasm for CL, researchers have reported mixed results in studies in which CL was used to improve the academic achievement of students with disabilities. More than 10 years ago, Tateyama-Sniezek (1990) conducted a review of this literature. She reported that only 50 percent of the relevant studies found statistically significant effects favoring CL. After reviewing the studies in her analysis, Stevens and Slavin (1991) suggested that CL effects varied with the particular program used. Stevens and Slavin noted that when the strategy included individual accountability and group rewards, results were more impressive. This observation was consistent with findings of an earlier review (Slavin, 1983) that concluded by emphasizing the importance of incorporating these components into CL programs.

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Still, Stevens and Slavin acknowledged that findings were not entirely consistent, and agreed with Tateyama-Sniezek that further evaluation was needed.

Since publication of Tateyama-Sniezek's (1990) review and the Stevens and Slavin (1991) rejoinder, researchers have continued to explore the importance of CL to students with disabilities within both regular and special education classrooms. Of particular interest to us is the research that has examined the effects of CL on the academic achievement of students with LD, given the current press on educators to account for their performance within state standards. The purpose of this article, then, is to review research conducted since Tateyama-Sniezek's review addressing the effects of CL on the academic achievement of students with LD. Like Tateyama-Sniezek's review, ours is a qualitative review. We were guided by a sense that detailed descriptions of the CL studies would allow us not only to summarize the overall findings of this research, but also to provide insight into important characteristics of the individual studies and the different approaches to CL that have been investigated. Such insights, we believe, will help to better inform future research and practice of CL with students with LD.

METHODS

Inclusion and Exclusion Criteria

Authors of studies in this review (1) involved students with LD in kindergarten through grade 12, (2) claimed to include CL as an intervention or intervention component, (3) reported CL effects in terms of academic achievement, and (4) employed experimental or quasi-experimental designs. Further, these investigations were published (or dated if not published) between 1990 and 2000, inclusive. Studies that focused on peer-mediated instructional strategies other than CL, such as Classwide Peer Tutoring (e.g., Delquadri et al., 1986), Peer-Assisted Learning Strategies (e.g., Fuchs et al., 1997), and cross-age tutoring (e.g., Elbaum et al., 1999), were not included because we considered the interactive structures of these strategies to be qualitatively different from those characterizing CL. For example, these peer-mediated strategies typically employ a more accomplished or older student to instruct another student, rather than a heterogeneous group of students working collaboratively to accomplish an assignment. It should be noted, however, that if a study used one or more of these peer-mediated strategies in combination with CL, the study was included in this review.

Documents Reviewed

The literature search involved three steps. First, we explored multiple electronic databases, including ERIC, Exceptional Child Educational Resources (ECER), PsycInfo, Education Abstracts, Education Index, and Dissertation Abstracts. We searched for articles published (or dated) between 1990 and 2000, inclusive, and used the following descriptors: cooperative learning, collaborative learning, teamwork, disabilities, LD, and learning difficulties or problems. Second, the first author of this article conducted a hand search of the 1990–2000 volumes of *Exceptional Children*, *Journal of Learning Disabilities*, *Journal of Special Education*, *Learning Disabilities Research & Practice*, and *Learning Disability Quarterly*. Each article was screened by title for any of the above descriptors, as well as for more general references to instructional strategies. The abstract and methods sections of promising articles were further scrutinized to determine whether they met the inclusion criteria. Finally, the first author inspected reference lists of investigations meeting the inclusion criteria for relevant studies not found by earlier search strategies.

In 15 studies, researchers used CL with students with LD, but these studies did *not* meet the other necessary inclusion criteria. Specifically, these studies were not experimental or quasi-experimental in design (e.g., Gibb et al., 1997; Hammer-Witty, 1997; Hollenbeck & Tindal, 1996; Hutchison, 1996; Lopez-Reyna, 1997; O'Connor & Jenkins, 1996), or did not directly examine the effects of CL on academic achievement (e.g., Cosden, Goldman, & Hine, 1990; Pomplun, 1996; Prater, Bruhl, & Serna, 1998; Putnam et al., 1996), or did not report achievement data specifically for students with LD (e.g., Costa, 1994; Koury, 1994). An additional 11 published and two unpublished articles describing 15 studies did meet the inclusion criteria. To our knowledge, these 15 studies comprise the corpus of CL studies published or dated between 1990 and 2000 meeting our selection criteria. They are the basis of this review.

RESULTS

Among the 15 studies, we identified seven different approaches to implementing CL, either in combination with other instructional methods or as a stand-alone program: (1) CL combined with computer-assisted instruction, (2) CL combined with strategy instruction, (3) CL combined with cross-age tutoring, (4) cooperative homework teams, (5) the "learning together" approach, (6) CL as part of schoolwide restructuring programs, and (7) structured versus unstructured CL. Six of the 15 studies reported statistically significant effects favoring CL. Table 1 presents the 15 studies in the order they are discussed below. This table includes study characteristics such as sample size, age or grade, setting, intensity and duration of treatment, achievement measures, findings, and effect sizes. Effect sizes were calculated using the difference between experimental and control means divided by the pooled standard deviation (the weighted average of the two group standard deviations). When considering these effect sizes, one should keep in mind that they tend to be affected by the type of outcome measure employed. Individually administered criterion-referenced tests, for example, are more likely to produce larger effect sizes than group-administered norm-referenced tests.

Cooperative Learning and Computer-Assisted Instruction

Malouf, Wizer, Pilato, and Grogan (1990) conducted two studies comparing CL versus individual learning using a

TABLE 1
Cooperative Learning Studies

Studies	*Sample (Students with LD)*	*Subject/Grade or Age*	*Setting*	*Intensity of Study*	*Duration of Study*	*Achievement Measures*	*Findings for Students with LD*	*Effect Sizes*
Cooperative Learning and Computer-Assisted Instruction								
Malouf, Wizer, Pilato, & Grogan (1990); Study 1	$N = 36$	Grammar Grade 7–8	Resource and self-contained	25-min. sessions per day	6 days	Criterion-referenced proofreading test	ns	0.31
Malouf, et al. (1990); Study 2	$N = 66$	Grammar Grade 4–6	Resource and self-contained	15–20-min. sessions per day	7 days	Criterion-referenced proofreading test	ns	0.09
Reiter (1994)	$N = 28$	Math-problem solving 7–14 years	Private school	50-min. sessions, 4 days per week	8 weeks	Written tests:		
						Easy problems	ns	0.39
						Medium problems	ns	0.49
						Hard problems	ns	0.48
						Computer tests:		
						Easy problems	ns	0
						Medium problems	ns	0.53
						Hard problems	ns	−0.74
Xin (1996); Study 1	$N = 25$	Math Grade 3	Regular classes	50-min. sessions, 4 days per week	20 weeks	SAT	F values not reported	0.34
Xin (1996); Study 2	$N = 16$	Math Grade 4	Regular classes	50-min. sessions, 4 days per week	20 weeks	SAT	F values not reported	−1.20
Cooperative Learning and Strategy Instruction								
Klingner & Vaughn (1996)	$N = 26$	Reading Grade 7–8	Resource	35–40-min. sessions per day	27 days	Gates-MacGinitie Passage	ns	0.17
						Comprehension Tests	ns	−0.36
Klingner, Vaughn, & Schumm (1998)	$N = 12$	Social studies Grade 4	Regular classes	45-min. sessions	11 days	Gates-MacGinitie Reading Test	ns	NA
Cooperative Learning and Cross-Age Tutoring								
Utay & Utay (1997)	$N = 72$	English Grade 2–6	Private school	2 sessions per week	12 weeks	WJ-R Written	ns	0.02
						Expression TOWL-2	ns	0.00
Cooperative Homework Teams								
O'Melia & Rosenberg (1994)	$N = 179$ (LD/ED)	Math Grade 6–8	Resource	15–20 min. per assignment; 10-min. per session; 5 days per week	8 weeks	Rate and percent of	$F = 17.57$*	0.39
						homework completion;	$F = 10.34$*	0.27
						CAT	ns	0.12
Learning Together Approach								
Brandt & Ellsworth (1996)	$N = 74$	Content areas Grade 9–12	Resource	20 min. per day, 3 days per week	15 weeks	NY State Competency Tests;	$t = 3.45$***	0.80
						NY State Second Language Proficiency Examination	$t = 4.40$***	1.02

TABLE1—*Continued*

Studies	*Sample (Students with LD)*	*Subject/Grade or Age*	*Setting*	*Intensity of Study*	*Duration of Study*	*Achievement Measures*	*Findings for Students with LD*	*Effect Sizes*
			Cooperative Learning and Schoolwide Restructuring					
Jenkins, Jewell, Leicester, Jenkins, & Troutner (1991)	$N = 9$ (LD, MR, or BD)	Reading & language Grade 6	Regular classes	Not specified	1 year	BASS Maze	ns	−1.16
						BASS Words Written	ns	−0.23
						Passage Reading Tests	ns	1.08
Jenkins, Jewell, Leicester, O'Connor, Jenkins, & Troutner (1994)	$N = 58$ (LD, MR, or BD)	Reading Grade 1-6	Regular classes	Not specified	1 year	MAT:		
						Vocabulary	$F = 5.04$*	0.85
						Comprehension	$F = 4.13$*	0.77
						Total reading	$F = 14.08$**	1.42
						Spelling	ns	0.19
						Language	ns	0.55
			Cooperative Learning and Schoolwide Restructuring					
Stevens & Slavin (1995a)	$N = 156$	Reading & language arts Grade 2–6	Regular classes	60–90 min. per day, 5 days per week	2 years	CAT Yr. 1:		
						Vocabulary	$F = 4.46$*	0.36
						Comprehension	$F = 4.11$*	0.35
						Language expression	ns	0.02
						Language mechanics	ns	0.19
						CAT Yr. 2:		
						Vocabulary	$F = 4.58$*	0.37
						Comprehension	$F = 3.98$*	0.34
						Language expression	$F = 4.32$*	0.35
						Language mechanics	ns	0.24
Stevens & Slavin (1995b)	$N = 94$	Reading, language arts, & math Grade 2–6	Regular classes	Not specified	2 years	CAT Yr. 1:		
						Vocabulary	ns	0.24
						Comprehension	ns	0.25
						Language expression	ns	0.33
						Language mechanics	ns	0.11
						Math computation	ns	0.35
						Math application	ns	0.17
						CAT Yr. 2:		
						Vocabulary	$F = 13.48$**	0.66
						Comprehension	$F = 14.39$**	0.65
						Language expression	$F = 11.41$**	0.65
						Language mechanics	ns	0.24
						Math computation	$F = 10.77$**	0.63
						Math application	$F = 3.75$*	0.34
			Structured versus Unstructured Cooperative Learning					
Gillies & Ashman (2000)	$N = 22$[a]	Social studies Grade 3	Regular classes	Not specified	18 weeks	Comprehension questionnaire; Graded word reading test	$F = 15.36$*** ns	1.32 0.04

Note. Effect sizes were calculated by dividing the difference between experimental and control means by the pooled standard deviation (Effect Size Determination Program; Wilson, 1996). SAT = Stanford Achievement Test; WJ-R = Woodcock Johnson-Revised; TOWL-2 = Test of Written Language-2; BASS = Basic Academic Skills Sample; MAT = Metropolitan Achievement Test; CAT = California Achievement Test. NA = data were not available to calculate effect size.

[a] Students in this study were identified as requiring specialist teacher support for at least one year and were reading one year or more below grade level; thus, although participants were not explicitly identified as "LD," we determined that this study met our selection criteria.

$^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

computer-assisted instruction (CAI) program designed to improve the capitalization and punctuation skills of students with LD. In the first study, middle school students reading at least two years below grade level were assigned randomly to either CL or individual learning. CL students were assigned to same-sex pairs based on the time of day they were able to participate.

The researchers trained all participants in capitalization and punctuation skills. The students practiced the skills on paper-and-pencil tasks, then applied them to a related computer task. CL students were trained to work together by asking questions, catching each other's errors, and explaining correct performance. Pairs received stickers based on their averaged scores on individual paper-and-pencil proofreading quizzes administered during the study. Individual learning students were trained to work alone, first on the paper-and-pencil tasks, and then by taking turns at the computer. They received rewards based on individual quiz scores. No significant differences were obtained between the two groups' posttest scores.

Malouf et al.'s (1990) second study involved a similar treatment with younger students reading at least two years below grade level. This time, Malouf et al. used a larger sample and increased the emphasis on academic performance and cooperative behaviors by awarding bonus points. As in the first study, differences between CL and individual students' posttest scores were not statistically significant.

Reiter (1994) compared the effects of cooperative versus individual learning on students' problem-solving skills. The researcher and two teachers trained study participants to solve math problems using computer software. The students were assigned randomly to CL or individual learning conditions. CL students practiced solving problems on the computers, rotating jobs as keyboarder, reader of instructions, and answer checker. Individual learning students worked alone at the computers. It is unclear whether individual accountability or rewards were in place for either condition. No statistically significant differences were found between the two groups' posttest scores.

Xin (1996) conducted two studies of computer-assisted CL in inclusive classrooms. Her first study compared the effects of CL to whole-class learning on students' math computation, application, and problem-solving skills (also see Xin, 1999). Six third-grade teachers, two from each of three elementary schools, were assigned randomly to cooperative or whole-class learning conditions, so that each condition was represented in the three schools. A special education teacher in each school worked collaboratively with the teachers. All classes included students with LD.

Every student in the study received math instruction from his or her teacher, then worked in a computer lab. CL students were grouped into heterogeneous teams of four, and paired within their teams. They worked at computers and completed worksheets in pairs, then checked their work in their teams. At the end of each week, they took a quiz. Each team competed for certificates based on their members' averaged quiz scores. Whole-class learning students received similar instruction as the CL group and completed the same worksheets and quizzes. However, they worked alone at the computers and did not receive rewards. Reliable differences favoring the CL group were found at posttest. No separate statistical analyses were reported for the students with LD; however, we calculated an effect size of 0.34 for these students, favoring the CL treatment.

Xin's (1996) second study compared the effects of CL with individual learning on students' math achievement. Two fourth-grade teachers from each of two schools were assigned randomly to CL or individual learning conditions. One special education teacher from each school worked with the teachers. Again, the classes included students with LD. Procedures were the same as those in Xin's first study, except that individual learning students received more individualized, small-group instruction. No significant differences in math achievement were found between groups before or after the treatments. Although Xin did not analyze data separately for students with LD, we calculated an effect size of –1.20, suggesting that the students with LD in the individual learning group surpassed those in the CL group on the achievement test.

Findings from studies of CL combined with CAI suggest an absence of treatment effects. However, several methodological issues prevent us from drawing firm conclusions. First, four of the studies had relatively small sample sizes (see Table 1: Malouf et al., 1990, Study 1; Reiter, 1994; Xin, 1996, Studies 1 and 2), which limited the researchers' power to find statistically significant effects. (Nevertheless, moderate effect sizes calculated on the data from three of these studies suggest that CL groups indeed outperformed comparison groups in several instances.) Second, two of the studies (Malouf et al., Studies 1 and 2) were characterized by short treatment durations (six and seven days, respectively). Effects of these treatments may not accurately represent the impact of CL when it is conducted for a longer duration.

Third, in most of the studies, comparison students received the same types of skill instruction as CL students. The only important difference between the groups was that comparison students worked alone on the computer tasks. In Xin's (1996) second study, however, comparison students received a different type of instruction than CL students. Whereas CL students received whole-class instruction in math, individual learning students received small-group instruction. This is the only study in which comparison students appeared to perform *better* than CL students. Individualized teacher instruction may account for positive effects that outweighed CL's impact on student achievement.

Cooperative Learning and Strategy Instruction

Klingner and Vaughn (1996) compared the effects of combining reciprocal teaching with either CL or cross-age tutoring on the reading comprehension of students with LD who spoke English as a second language (ESL). Participants were assigned randomly to cross-age tutoring or CL groups. One of the researchers taught all students to use reciprocal teaching comprehension strategies (i.e., prediction, summarization, question generation, and clarification) while reading text. The researcher modeled these strategies by "thinking aloud" as she read a passage; she then led the students in a text-related discussion. Gradually, the researcher withdrew support, and eventually students took turns as the "teacher." Following training, students in the cross-age tutoring group were paired with younger students, to whom they taught the reciprocal teaching comprehension strategies. Students in the CL condition implemented the reciprocal teaching strategies in groups of three to five. No other elements of this CL strategy were reported.

Students in both groups made statistically significant gains from pre- to posttreatment; however, no significant differences were found between the two groups' gain scores. Whereas the treatments may have been equally beneficial, another explanation for the lack of reliable between-group differences is the relatively small sample size, which reduced statistical power. Also, the authors reported that initial reading ability and oral language proficiency were important factors related to students' gains during the treatments. Students' limited English proficiency may have reduced the benefits CL might otherwise have had.

Klingner, Vaughn, and Schumm (1998) evaluated a strategy called Collaborative Strategic Reading (CSR). Five fourth-grade classes that included students with LD were matched according to each class's average scores on a word-identification test. The classes were then assigned randomly to CSR or a control group. Students in both conditions learned the same social studies content. The researchers trained the CSR students to use comprehension strategies (previewing, monitoring comprehension, restating the main idea, and summarizing) in heterogeneous cooperative learning groups of five or six. These students then used the strategies to learn content from a social studies textbook. Students took turns as group leader and recorder. It is unclear whether individual accountability or rewards were in place. Students in the control condition received instruction from one of the researchers, who followed the instructional guidelines provided in the social studies textbook.

Overall, the CSR students made reliably higher gains than students in the control group. However, CSR students with LD did not reliably outperform control students with LD. Interpretation of these findings is complicated somewhat by the small number of students with LD included in the study (see Table 1).

Cooperative Learning and Cross-Age Tutoring

Utay and Utay (1997) investigated whether a combination of CL and cross-age tutoring improved the writing skills of students with LD. Students were matched based on similar grade and pretest scores, then students from each matched pair were assigned randomly to treatment (CL and cross-age tutoring) or control groups. Both groups learned to use a word-processing program to write stories for a literary magazine. In the treatment group, sixth graders were paired randomly with half of the fourth graders, fifth graders were paired randomly with third graders, and half of the fourth graders were paired randomly with second graders. The older students in each pair learned writing skills from a classroom teacher, then taught these skills to their younger partners. Pairs worked together with the word-processing program to apply the skills to writing stories, taking turns with CL jobs (e.g., leader, materials handler, and time keeper). Control students received the same writing instruction and produced stories using the word-processing program, but they worked individually.

The researchers found no significant differences between the two groups from pre- to posttest. Using computer writing samples may have been a more sensitive measure of students' writing improvement during the study than the standardized measures that were used. Also, the 12 weeks of treatment may not have been long enough for the treatment to have had a strong effect for students with LD. Another consideration is that, although CL was explicitly identified as part of the treatment (an important criterion in including studies in this review), the authors did not specify the components of CL that were used, other than that pairs used CL jobs. No mention was made of individual accountability, group rewards, or other distinguishing features of CL described in previous research. Thus, it is unclear how CL added to the cross-age tutoring intervention with which it was combined.

Cooperative Homework Teams

O'Melia and Rosenberg (1994) asked 10 special education math teachers to implement Cooperative Homework Teams (CHT) in five suburban middle schools. Each teacher taught two classes of students with LD and emotional disturbance (ED) that were assigned randomly to CHT and control conditions. CHT students worked in three- or four-member heterogeneous groups. Each day, the teachers delivered a direct instruction math lesson, then assigned homework based on this lesson. On the following day, members of the CHT groups submitted their homework to the team "checker" who graded the homework. Team members helped each other correct mistakes before turning it in to the teacher. At the end of the week, individual homework scores were averaged into team scores, and teams were awarded certificates based on explicit criteria. Control students received identical instruction and homework assignments, but did not work in groups. The reward system for these students was determined by their teachers.

Prior to treatment, CHT students completed higher rates of homework and got a higher percent correct on these assignments than did those in the control group. Following treatment, CHT students had reliably higher gains in homework completion rate and accuracy. Whereas CHT may have been responsible for these more impressive gains, an equally plausible explanation is that CHT students demonstrated higher completion rates and accuracy at the start. No significant difference was found between the two groups' gains on a math-achievement test.

Learning Together Approach

Brandt and Ellsworth (1996) examined the effects of CL on the achievement of high school students. Twelve self-contained special education classes in English, math, science, Spanish, and ESL were chosen randomly from 20 special education classes in which the teachers had been trained in CL. Six classes used CL, and six were designated as "controls." The authors did not specify how these designations were made.

CL students participated in the "learning together" approach, which included five CL components recommended by Johnson and Johnson (1994): rewarding groups based on the performance of each member, training students to encourage and facilitate each other's achievement, holding individuals accountable for learning skills, using interpersonal skills, and reflecting on how well the group functions. Activities included whole-group discussions, hands-on activities, games, and individual worksheets. How students were grouped and trained was not specified. The authors reported statistically significant achievement results favoring the CL condition on all posttest measures.

Findings from this study support an approach to CL that incorporates empirically tested components (see Johnson & Johnson, 1994). Further, CL appeared to have positive effects across a variety of subject areas. Because the study was conducted in only one school, and procedures for assigning students to groups were unclear, replications of this study would strengthen the importance of its findings.

Cooperative Learning and Schoolwide Restructuring

Jenkins, Jewell, Leicester, Jenkins, and Troutner (1991) and Jenkins, Jewell, Leicester, O'Connor, Jenkins, and Troutner (1994) investigated a schoolwide model for accommodating students with and without disabilities in regular classrooms. One "experimental" school and one "comparison" school participated in these investigations. Jenkins et al. (1991) prepared the experimental teachers to implement Cooperative Integrated Reading and Composition (CIRC) in sixth-grade reading and language arts classes. CIRC was adapted from Stevens, Madden, Slavin, and Farnish (1987), and included teacher-led basal reading activities, followed by a set of individual and heterogeneous group activities. Individual grades on weekly tests were averaged into team scores, and points were awarded to teams based on these scores.

Six sixth-grade students with LD, mental retardation (MR), and behavior disorders (BD) participated in CIRC. Three sixth-grade students with LD, MR, or BD participated in the comparison school. The authors found no statistically significant differences between students with disabilities in the experimental and control schools on any achievement measures (see Table 1); however, these results are difficult to interpret because of the small size of the sample.

During the second part of this investigation (Jenkins et al., 1994), the entire experimental school implemented a combination of treatments, including CIRC, cross-age tutoring, supplementary instruction in phonics, and in-class instructional support from specialists. Experimental students included 20 with LD, two with MR, and one with BD. Comparison students included 32 with LD, one with MR, and two with BD. Pre- and posttest scores for 11 students with disabilities in the treatment group and 19 students with disabilities in the comparison group were provided; data were not provided for the other 28 students with disabilities. Following treatment, students with disabilities in the experimental group reliably outperformed those in the comparison group on several subtests of the achievement measure.

In a similar effort to devise an approach to restructuring schools, Stevens and Slavin (1995a) conducted a long-term study to determine the effects of CL on the academic achievement of elementary school students. The study was conducted in three experimental and four control schools and included students with and without LD. Students with LD in all the schools received part of their reading instruction in a special education resource classroom. In the experimental schools, special education teachers were trained in the CIRC program, and students with LD were included in CL activities in the regular classrooms for part of their reading and language instruction. Comparison students with LD returned to regular classrooms to complete independent seatwork. After the first year, experimental students with LD demonstrated greater improvement than comparison students on measures of vocabulary and comprehension. After the second year, experimental students achieved greater gains than comparison students on vocabulary, comprehension, and language expression.

In a second two-year study, Stevens and Slavin (1995b) again investigated the long-term effects of CL in a schoolwide setting. Five suburban elementary schools participated. Twenty-one classes in two treatment schools were matched with 24 classes in three comparison schools on achievement scores, as well as ethnic and socioeconomic backgrounds of the students. Again, all classes included students with and without LD.

Teachers were trained to implement the CIRC program in reading and language arts, as well as Team Assisted Individualization (TAI) for math, and Jigsaw II, Teams-Games-Tournaments, and Student Teams Achievement Division, all generic CL models that could be used in content-area classes. No details were provided regarding the activities that took place in the comparison schools. After the first year, there were no statistically significant differences between groups on any outcome measures. After the second year, however, students with LD in the treatment group had reliably higher scores on the vocabulary, comprehension, language expression, math computation, and math application tests than those in the comparison group.

Findings from the school restructuring studies are important to CL research because they suggest that CIRC and other programs that make use of CL can be effective in improving the achievement of many students with LD who are included in regular classrooms. Also, each of these studies explicitly incorporated empirically tested CL components, supporting Slavin's (1983) observation that such features increase the likelihood of positive outcomes. However, whereas the findings from the research by Jenkins et al. (1994) and Stevens and Slavin (1995a, 1995b) are perhaps among the most persuasive of the CL studies that examined achievement of students with LD, the school restructuring studies share several characteristics that must be considered when interpreting results.

First, although schools were reported to be similar demographically, they were not assigned randomly to experimental and control conditions. This is potentially problematic because teacher effects, administrative and parental involvement, and other school variables could have influenced results. Second, because the experimental students' achievement improved significantly over that of control students in three of the studies, the authors concluded that the cooperative models were a successful long-term strategy. However, there were multiple components to the programs, such as cross-age tutoring (Jenkins et al., 1994), support from special education teachers (Jenkins et al., 1994; Stevens & Slavin, 1995a), and parent and teacher collaboration (Stevens & Slavin, 1995b). Further, the instructional programs were very complex. For example, CIRC includes teacher-led vocabulary and comprehension instruction, partner reading, writing, single word-reading practice, comprehension strategies, and home reading. Thus, it is difficult to determine the extent to which CL per se played a role in improved student learning.

A third point is that although students with LD in the experimental groups made greater gains than their counterparts in comparison groups, their actual scores were far below those of their same-age peers. As Stevens and Slavin (1991) suggest, it is critical to further examine which components of CL strategies contribute most to the success of these students, and also to find ways to make CL more effective in closing the achievement gap between students with LD and their nondisabled peers.

Structured Versus Unstructured Cooperative Learning

In a recent study, Gillies and Ashman (2000) directly examined whether specific components of CL made a difference in the achievement of students with learning problems. The authors compared the effects of structured versus unstructured CL groups on the achievement of students in 25 inclusive third-grade classrooms in Australia. The classrooms included students with learning difficulties in reading (students in this study were identified as requiring specialist support for at least one year and were reading at least one year below grade level; thus, although participants were not explicitly identified as "LD," we included the study in our review). All students were stratified based on achievement scores and assigned randomly to CL groups. The 25 classrooms were then assigned randomly to structured or unstructured CL conditions.

In the structured CL groups, teachers trained students to use small-group and interpersonal behaviors recommended by Johnson, Johnson, and Holobec (1990), such as accepting responsibility, encouraging group involvement, and sharing resources. Students practiced these behaviors, then planned how they would use them to work together on assignments. Students in the unstructured CL groups received no training, but had the same amount of time to plan how they would work together. Students in both conditions then worked on problem-solving activities developed from units in a social studies text book.

All students completed a comprehension assessment immediately following an introductory social studies unit (before the study began) and again after the last unit. After treatment, students in the structured CL group performed reliably better than those in the unstructured group. Such results again support the premise that CL effects vary depending on how it is implemented (e.g., Stevens & Slavin, 1991). Although the study was not designed to demonstrate the effectiveness of CL in comparison to other types of instruction, it indicates that preparing students to use structured CL components can be more effective than simply grouping students and telling them to work together.

DISCUSSION

Before discussing our findings, we wish to draw attention to several limitations of our review. First, although we attempted to be systematic and thorough in our search and selection procedures, it was occasionally difficult to determine whether a CL strategy had been implemented. This is because there are many versions of (and names for) CL in the literature. Despite our best efforts, therefore, we may have inadvertently included a study that did not really involve CL or excluded a study that did involve CL.

Second, we only examined studies with academic outcomes. A number of studies (e.g., Cosden, Goldman, & Hine, 1990; Lopez-Reyna, 1997; O'Connor & Jenkins, 1996; Prater, Bruhl, & Serna, 1998; Putnam et al., 1996) have used different outcomes, such as CL's impact on the behaviors and attitudes of students with LD. Such outcomes represent dimensions important to the quality of education for these students, but were considered beyond the scope of this review.

Our third point is more of an explanation than a limitation. Our review is essentially qualitative in nature; it focuses on the different ways CL has been implemented with students with LD and the effectiveness of these approaches for boosting academic performance. We considered conducting a quantitative synthesis of this literature. Meta-analysis, for example, in principle could have indicated the overall academic effects of CL as compared to non-CL interventions, as well as examined relations between CL and variables such as content area and grade level. However, we chose to perform a qualitative review for two reasons. First, in most of the studies, CL was implemented as part of a multiple component intervention package. Because these intervention packages were very different from each other, aggregating data across them would probably not accurately reflect CL's effects. Second, methodological concerns among the studies, such as small sample sizes, lack of random assignment to treatment and control groups, and short treatment durations, preclude firm conclusions about most of the individual studies. Thus, we believed that a relatively detailed look at each study would better inform future research and practice than a quantitative synthesis.

Below, we discuss our findings by addressing several important questions about CL's effectiveness. We end with implications for research and practice.

Issues Relating to CL's Effectiveness

On Parsing CL Effects

As mentioned, the authors of many of the studies in this review embedded CL in multicomponent treatment packages. In all but one study (Gillies & Ashman, 2000), it was combined with computer-assisted instruction, reciprocal teaching, cross-age tutoring, special classroom assistants, or direct instruction. A strong argument no doubt can be made for the use of multicomponent treatments with children with disabilities, but by combining CL with other interventions, one cannot determine whether the use of CL alone accounts for student outcomes. Researchers who have embedded CL into a complex treatment package and who wish to separate effects for CL must undertake careful component analyses of their interventions. Such work is not easy, which is why there are few component analyses of interventions in all the educational research literature.

What's the "Active" Ingredient?

As Stevens and Slavin (1991) noted, the treatment studies reviewed by Tateyama-Sniezek demonstrated greater effects when CL included empirically supported elements such as individual accountability and group rewards. To an extent, this observation holds true for the studies in the present review. Researchers reporting the use of such elements (Brandt & Ellsworth, 1996; Gillies & Ashman, 2000; Jenkins et al., 1991; Jenkins et al., 1994; Malouf et al., 1990, Studies 1 and 2; O'Melia & Rosenberg, 1994; Stevens & Slavin, 1995a, 1995b; Xin, 1996, Studies 1 and 2) produced a mean effect size of 0.30, whereas researchers who did not report use of these features (Klingner & Vaughn, 1996; Klingner, Vaughn, & Schumm, 1998; Reiter, 1994; Utay & Utay, 1997) produced a mean effect size of 0.09.

However, several researchers who did include these features did not report strong CL effects (Jenkins et al., 1991; Malouf et al., 1990, Study 2; Xin, 1996, Study 2; mean effect size = –0.09). These researchers may not have demonstrated greater CL effects because they used relatively small sample sizes, measures possibly insensitive to treatment objectives, or treatments of short duration. It is also possible that comparison groups participated in treatments that were equally or more effective than CL (e.g., CAI: Malouf et al.; small-group instruction: Xin, Study 2).

Is CL Effective in Comparison to Other Best Practices?

A third issue relating to CL's effectiveness involves the interventions with which CL has been formally compared. Students with LD appeared to have responded as positively, or more positively, to other types of peer-mediation (e.g., Klingner & Vaughn, 1996) or to individualized teacher-directed methods (e.g., Xin, 1996). In one study in which CL students outperformed controls (Brandt & Ellsworth, 1996), the control group received no specific intervention. Perhaps there is some benefit to using CL in place of more conventional instructional approaches; at the same time, other peer-mediated or individualized approaches may yield even more positive outcomes for students with LD. Future research should continue to examine CL in comparison to other grouping and instructional strategies. Of course, in doing such research, investigators should consider not only the academic outcomes of CL in comparison to other treatments, but also social and attitudinal outcomes. Whereas other "best practice" interventions might yield academic gains equivalent or superior to CL outcomes, teachers and parents may prefer CL because of its potential to improve the overall school experience of students with LD.

Is There a Setting Where CL Works Best?

Whereas all the studies in Tateyama-Sneizek's (1990) review took place in settings that included students with and without disabilities, about half the studies in this review were conducted in special education classrooms. This is noteworthy since CL is widely advocated by practitioners and researchers because of its presumed capacity to accommodate diverse student groups. Studies conducted in special education classrooms were associated with smaller effects for CL (mean effect size = 0.27), than those implemented in regular education classrooms (mean effect size = 0.44). This result may not surprise advocates of CL as an inclusive strategy. They would likely argue that, in regular classrooms, cooperative groups tend to be more heterogeneous, providing more academic support to students with LD. They may be right. On the other hand, there are other possible explanations for this result. For example, students with LD in special education classrooms may have had more severe disabilities than those in regular classrooms. Students with more severe disabilities may be less responsive to even the most well-designed treatments (see Torgesen, 2000).

Do CL Students Make Sufficient Progress?

Regardless of the place in which CL is implemented, a question we expect to become increasingly important is whether CL students with disabilities make sufficient progress. An important goal of special education that is often overlooked is not only to improve students' performance in school, but to close the achievement gap between students with LD and their average-achieving peers (Vaughn, Gersten, & Chard, 2000). Several of the studies in this review report academic gains for CL students with LD, but do not provide evidence that these gains resulted in performance more commensurate with their peers. For example, those students with LD in the schoolwide restructuring studies (e.g., Stevens & Slavin, 1995a, 1995b) who made significant gains in comparison to controls were still achieving well below their average-achieving peers. Support for the use of CL with students with LD would be further strengthened if it could be demonstrated that CL not only improves students' academic achievement in comparison to an alternative treatment or control group, but that it also reduces the gap between them and their average-achieving peers.

Implications for Research and Practice

CL has been a focus of study and commentary for more than 20 years. Researchers, including those whose work is reviewed here, have investigated CL's effects in important subject areas and in innovative ways. This work has been meaningful and should be appreciated by practitioners, policymakers, parents, and other researchers, especially considering the difficulty of conducting intervention research in schools, a venue in which researchers have little control or leverage.

Nevertheless, before we can fully understand whether CL is an effective strategy for improving the academic achievement of students with LD, a greater number of larger and longer-running field-based experiments must be conducted. The importance of CL on the academic achievement of students with LD would be more clear if its effects could be isolated from those of more complex treatment packages and if the "active ingredients" of CL could be identified. Rigorous, well-designed studies examining which dimensions of CL are most important to its success with students with LD are necessary to transform CL from a "promising" instructional strategy to an unqualified effective approach. Furthermore, whether CL has different effects in regular versus special education classrooms, and whether CL effects are sufficient for reducing the achievement gap between students with LD and their average-achieving peers, must be further examined. Data from such investigations will enable us to better quantify, synthesize, and interpret CL's effects on students with LD.

It is equally important to explore other innovations that may be even more efficient and effective in reducing the gap in achievement between students with LD and their nondisabled peers. For example, Classwide Peer Tutoring (e.g., Delquadri et al., 1986) has shown promising effects on the academic performance of students with disabilities. Comparisons of CL to this and other innovative practices may give further insight into its relative value for students with LD.

Many classroom teachers have embraced CL as a preferred instructional strategy (e.g., Antil et al., 1998). However, in light of inconclusive findings in the literature regarding the efficacy of using CL with students with LD, teachers may wish to use caution in deciding whether to use CL to improve these students' academic performance. Research that reveals which features are most essential to CL's effectiveness, when and where it is most successful, and whether it results in sufficient academic gains for students with LD should help to better inform teachers of its utility in the classroom. Teachers who choose to implement CL might also systematically evaluate whether it is indeed benefiting their students, and explore the use of other empirically validated teaching methods when CL does not elicit desired academic gains. Above all, researchers and practitioners alike should continue to explore grouping and instructional strategies that enable all students to achieve at higher levels.

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