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Classwide Peer Tutoring With or Without Competitive Reinforcement: Impact on Academic Growth and Intrinsic Interest

Dale R. De Weerd

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Classwide Peer Tutoring with or without Competitive Reinforcement:
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by

Dale R. De Weerd

B.A. Calvin College, 1990

Action Research Report
Submitted in Partial Fulfillment
Of the Requirements for the
Degree of Master of Education

Department of Education
Dordt College
Sioux Center, Iowa
July, 2003
Classwide Peer Tutoring with or without Competitive Reinforcement:

Impact on Academic Growth and Intrinsic Interest

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# Table of Contents

Approval Page................................................................................................. i  
Acknowledgements.................................................................................. ii  
List of Table and Figures ........................................................................ iv  
Abstract....................................................................................................... v  
Review of Literature.................................................................................. 1  
Method.......................................................................................................... 7  
Results........................................................................................................ 13  
Discussion.................................................................................................... 14  
References.................................................................................................... 21  
Appendix A................................................................................................. 25  
Appendix B................................................................................................. 26  
Appendix C................................................................................................. 30  
Appendix D................................................................................................. 34  
Appendix E................................................................................................. 35  
Appendix F................................................................................................. 37  
Vita.............................................................................................................. 45
List of Tables and Figures

Table 1: Multiplication Pretest and Posttest Scores (Percentages) ............... 39
Table 2: Intrinsic Interest Questionnaire Pretest and Posttest Scores ........... 40
Table 3: Independent t-Tests for Content Coverage Variable ...................... 41

Figure 1: Academic Gains in Math .................................................. 42
Figure 2: Interest in Math .............................................................. 43
Figure 3: Content Coverage ............................................................ 44
Abstract

This study examined the effects of Classwide Peer Tutoring on students’ academic gains and intrinsic interest in two fourth-grade math classes under two conditions—with competitive reinforcement (CWPT + CR) and without competitive reinforcement (CWPT – CR). Extending spelling CWPT research of C. C. Cheung and S. Winter (1999), this study utilized an adapted multiplication pretest and posttest and the Attitude Toward Mathematics Scale, developed by Peterson (1978). Study results showed a lack of statistical significance regarding group differences at posttest. However, due to traditional CWPT’s impact on classroom atmosphere, peer perception, and learning focus, the investigator recommends eliminating competitive reinforcement for use in a Christian, collaborative classroom.
A wide gulf separates educational researchers and classroom teachers. The two ends of the spectrum are valid research findings and classroom practice. When classroom practitioners incorporate research findings, they often make modifications within their specific contexts. Initiated by teachers’ philosophies and goals and particular student groups’ needs, these modifications trouble researchers who have spent much time showing how classroom strategies depend on faithful implementation of procedures (Vadasy, Jenkins, Antil, Phillips, and Pool, 1997).

Many promising, field-tested behavioral strategies for classroom application exist. Kunkel (1987) and Schwartz and Lacey (1982) (as cited in Maheady, Harper, Mallette, and Winstanley, 1991) state that educators often limit these interventions to a small number of settings, a restricted student population, and few target behaviors. However, in today’s increasingly diverse, financially strapped schools, peer tutoring programs are expanding in scope. Kohler and Greenwood (1990) offer three reasons for this increased interest. First, peer tutoring strategies make it quite easy to individualize instruction and manage students’ behavior. Second, their emphasis on high rates of academic responding makes these programs more effective than some traditional teacher-mediated methods. Third, peer tutoring formats have the potential to strengthen students’ social interactions. Additionally, student tutors provide valuable instructional assistance without increasing schools’ budgets (Buckholdt and Wodarski, 1978).

Classwide Peer Tutoring (CWPT), one well-documented instructional strategy, offers students in heterogeneous classrooms opportunities to both teach and learn from peers; more time on task; immediate, specific feedback; and social skill development (King-Sears & Bradley, 1995). A University of Kansas research team designed CWPT at
the Juniper Gardens Children’s project to strengthen the learning of Chapter One students, who were not actively engaging the curriculum. This intervention was validated, its elements were refined, and its use was expanded over the course of single-subject and experimental-control studies in the 1980s (e.g., see Greenwood et al., 1987).

CWPT is based on the opportunity to respond principle: academic growth requires frequent interaction between environmental factors (e.g., student tasks) and the level of active student responding (e.g., academic talk) (Delquadri, Greenwood, Whorton, Carta, and Hall, 1986). By utilizing peer supervision, CWPT offers every child in the class ten minutes of direct practice of functional academic skills (e.g., oral reading). Delquadri et al. report that academic behaviors often increase from 20% to 70% during tutoring sessions.

To encourage high rates of academic responding, CWPT includes a group contingency, defined as “a situation where members of a group are reinforced on the basis of the average performance of all of the group members” (Buckholdt and Wodarski, 1978, p. 59). At the beginning of each week, the teacher assigns student pairs to one of two competing teams. Switching roles halfway through each tutoring session, students serve as both tutor and tutee. The faster and more accurately tutees work on the academic task at hand, the more points they earn for their teams. While students work in their dyads, the teacher walks around to award bonus points for proper tutoring behaviors. At the end of each session, the teacher adds up the pairs’ points to get two team totals, and the class applauds the winning group. At the end of the week, students individually take a test on that week’s tutored material, and the teacher adds test points to the other points earned that week to get a grand total. The winning team receives applause and
achievement certificates or special privileges, while the second team receives applause for sportsmanship and effort.

CWPT, with its well-documented procedures and user instructions, has modest requirements (Vadasy et al., 1997) and has benefited many students with a wide range of personality types and learning styles in the areas of math, reading, spelling, and vocabulary (Arreaga-Mayer, 1998). Program users, however, often modify this easily implemented and widely applicable classroom strategy. Altered implementation procedures include incorporating inappropriate tutoring material; scheduling fewer tutoring sessions each week; reducing the number of student participants; and adding, eliminating, or substituting component procedures (Greenwood, Terry, Arreaga-Mayer, and Finney, 1992).

The research literature shows a number of instances where teachers have either modified or eliminated CWPT's point system component, designed to motivate diverse learners to stay on task. In a study examining spelling achievement and participant satisfaction with the CWPT format, researchers noted that one teacher participant got rid of the two competing teams and challenged her students as a single team to equal or better daily point earnings. She made this modification out of ethical concerns (Greenwood et al., 1987). In a study exploring the implementation requirements of CWPT in elementary spelling instruction, Maheady et al. (1991) reported that while the eight teacher participants agreed with the general goals of the tutoring program, the majority of them were concerned about the use of points and the public display of students' scores. One teacher dropped these components, and her students declined academically towards the end of the study. Greenwood et al. (1992) observed one of five
teachers trained and monitored in their use of spelling CWPT for nineteen weeks drop the bonus point component. Of the five examined classes, however, this teacher’s students made the highest gains in spelling proficiency, perhaps because her class had the most opportunities to participate in CWPT. Vadasy et al. (1997) chose CWPT reading instruction as a vehicle for studying teacher receptivity and implementation experience. All six implementing teachers made procedural changes, partly out of concern with the point system. To counteract competition, the teachers adapted the system to highlight helping, cooperative behaviors. This study did not show whether teacher modifications were positive or negative regarding student learning. In short, some practitioners believe that CWPT’s competitive point system threatens to overshadow the program’s cooperative aspects (e.g., peer academic feedback).

In the past eighty years, researchers have examined how cooperative, competitive, and individualistic classroom structures impact student effort and academic growth. Buckholdt and Wodarski (1978) state that a cooperative structure centers on groups rather than individuals and that group members share responsibility for the group’s success or failure. CWPT has a cooperative element because it involves student pairs working together to learn academic content and provide immediate feedback. Deutsch (1949, 1962) (as cited in Johnson, Maruyama, Johnson, Nelson, and Skon, 1981) defines a competitive structure as one in which an individual or group of people reach a goal at the expense of another party’s goal attainment. CWPT contains a competitive element in that two teams work against each other for the highest point totals, which are publicly announced and posted on a daily basis. This classroom strategy, therefore, falls under the goal structure of cooperation with intergroup competition.
Johnson et al. (1981) conducted a meta-analysis regarding four common goal structures—cooperation without intergroup competition, cooperation with intergroup competition, interpersonal competition, individualistic efforts—and their effects on student effort and achievement. Based on the meta-analysis results, the authors tentatively proposed that cooperation without intergroup competition brings about higher productivity and achievement than cooperation with intergroup competition, particularly in short-term situations requiring a group product. However, the authors cautioned that more research was necessary because available studies directly comparing the two structures were limited.

A recent study directly compared the two structures within a CWPT context. At a Hong Kong secondary school, Cheung and Winter (1999) worked with ethnic Chinese students who were struggling with spelling English words that were part of an integrated science curriculum. One class underwent CWPT with intergroup competition: students were placed on two teams to compete for points. The second class participated in CWPT without intergroup competition: students worked in pairs without teams and a point system. Both groups made significant gains in spelling performance. However, the students involved in intergroup competition made significantly greater growth, apparently due to higher levels of academic responding.

Cheung and Winter (1999) modified CWPT to examine not only students’ academic growth, but also their intrinsic interest in spelling. Intrinsic interest refers to the sense that an activity—spelling, in this case—is worth doing for its own sake. While a number of researchers have studied children’s satisfaction levels towards CWPT (e.g., see Greenwood et al., 1987; Maheady et al., 1991), few have examined CWPT’s impact
on children’s inherent interest in subject areas incorporating the intervention. Before and after CWPT implementation, Cheung and Winter administered to both classes a questionnaire measuring intrinsic interest in integrated science. In spite of greater learning gains, the students participating in intergroup competition showed significantly lower intrinsic interest in the science curriculum after the intervention. However, the change’s magnitude was small, only removing nonsignificant differences at pretest. The authors speculated that the magnitude might have been bigger had the study focused on intrinsic interest in spelling or the English language instead of integrated science.

The “overjustification effect” may be one possible explanation for the decline in the Chinese students’ intrinsic interest in integrated science. First theorized by Deci (1971), the overjustification hypothesis states that “a person’s intrinsic interest in an activity may be decreased by inducing him to engage in that activity as an explicit means to some extrinsic goal” (Lepper, Greene, and Nisbett, 1973). Lepper et al., who also investigated the “overjustification effect,” suggest that an exception might occur when a child’s intrinsic interest in a certain activity is low from the start: the employment of extrinsic incentives could increase this child’s interest level. In the case of the Hong Kong students who competed for points, their intrinsic interest in integrated science may have decreased as they began to see the extrinsic reward (e.g., certificate or special privileges) as a control mechanism for their academic responding.

CWPT’s use of a competitive point system leading to an extrinsic reward is incompatible with the investigator’s beliefs about how and under what conditions students should practice academic and social skills. Instead of using competition and certificates or special privileges to control the frequency of children’s cooperative
behavior, the investigator would rather emphasize the reinforcers of purposeful work and opportunity to serve peers through tutoring efforts.

To further investigate the use of reinforcers within a CWPT program, the investigator set up a study somewhat similar to Cheung and Winter’s (1999): both concerned the effects of a modified CWPT program on students’ academic gains and intrinsic interest. The present study, however, involved North American fourth graders in math CWPT, as opposed to ethnic Chinese secondary students in spelling CWPT. Concerning content, multiplying by 1-digit factors was a more complex task than spelling English words found in an integrated science curriculum. Also, while the 1999 study manipulated both point and praise reinforcement, the present study allowed tutors in both groups to give praise to their tutees. The investigator believes that judicious, specific, peer praise can support classroom community building and intrinsic interest. Deci (1971) showed—with marginal statistical significance—that students do not view positive verbal feedback as a control mechanism, even though it is an extrinsic reinforcer. The questions under current consideration are (1) How will the presence/absence of competitive reinforcement affect fourth graders’ academic growth in a CWPT multiplication unit? and (2) How will the presence/absence of competitive reinforcement affect fourth graders’ intrinsic interest in math?

Method

Participants

This study took place in a mid-size Christian school located in a community with a population of 10,000 on the western coast. The parent-run school is supported by nine Christian Reformed, Reformed, and United Reformed churches; is accredited by the
Western Association of Schools and Colleges (WASC); and is associated with Christian Schools International (CSI). Forty-six students from two fourth-grade classrooms participated in the study. The investigator flipped a coin to randomly assign the two forms of CWPT to the intact groups (Crowl, 1996). 10 girls and 12 boys from one class carried out CWPT with competitive reinforcement (CWPT + CR). (Two students from this class did not participate in the study because of their math Resource Room schedule). The other class, containing 12 girls and 12 boys, took part in CWPT without competitive reinforcement (CWPT – CR). The investigator considered the children’s personalities and prior academic performance in math when forming both groups’ tutoring pairs.

Materials

Including questionnaire administration, the math CWPT unit took 17 days (see Appendix A). The focus was Chapter 5: *Multiplying by 1-Digit Factors*, pages 196A-245 in the 2001 edition of Scott Foresman-Addison Wesley *Math* for Grade 4. Of the 13 available lessons, 8 were appropriate for CWPT application: they offered direct practice with multiplying by 1-digit factors and elicited overt tutee responses (Maheady et al., 1991). All students covered skipped lessons (e.g., word problem analysis) after the study was completed. Tutoring pairs completed daily assignments taken from the student edition of the math series. The investigator adapted quiz and test material from the Scott Foresman-Addison Wesley Grade 4 *Assessment Sourcebook* (2001) for the unit’s three quizzes and the pretest and posttest. The modified quizzes and tests did not include problems pertaining to skipped lessons (see Appendix B).

To determine the students’ intrinsic interest in math both before and after the CWPT multiplication unit, the investigator utilized the Attitude Toward Mathematics
Scale, developed by Peterson (1978) for use in grades 4-6. This self-administered paper and pencil questionnaire consists of 15 items with a 5-point agree-disagree scale (see Appendix C). Six studies incorporating the scale showed an average pretest reliability of .90 and an average posttest reliability of .90. Cronbach's alpha was used to compute these coefficients (Peterson). Several studies offer predictive validity. One of them, focusing on students' aptitudes and cognitive processes during direct instruction, found that students' reports of self-motivating statements were significantly positively related to their attitudes towards math on both the pretest and posttest (Peterson, Swing, Braverman, and Buss, 1982).

The CWPT sessions required custom-made materials and standard supplies for investigator and student use. Both student groups used an overhead projector, *Pairs Chart* transparency, *Skills for Tutors and Tutees* chart, answer keys, and kitchen timer. The investigator used the projector and transparency to identify team membership (for the CWPT + CR group only), student roles, and math assignments. The investigator posted the skills chart for students' reference as they worked. Tutors used the investigator-made answer keys to provide immediate feedback regarding their tutees' work. The timer signaled the tutors and tutees to switch roles during a session.

The CWPT + CR group utilized several additional items—*Team Point Chart*, *Point Sheet*, Vis-a-Vis pens, water bottles, sock rags, and colorful pencils with sticker flags. The investigator used the point chart to publicly post daily and weekly team point earnings and the flagged pencils to award each week's winning team. Student pairs used the remaining items to record and erase their daily point earnings. (See Appendix D for sample custom-made materials.)
Procedure

Before CWPT implementation, the investigator sent home a consent form, which asked each fourth grader’s parent(s) to indicate approval/disapproval for the child’s participation in the study (see Appendix E). The investigator next administered a questionnaire, the Attitude Toward Mathematics Scale, which measured participants’ intrinsic interest in the subject of math. Then all students individually took a written pretest to determine their pre-existing knowledge of multiplying by 1-digit factors.

After the pretest, the investigator trained both groups in CWPT. The training included explanation, modeling, and practice with teacher feedback (Delquadri et al., 1986). For the CWPT + CR group (i.e., students receiving competitive reinforcement), the investigator introduced CWPT as a way to practice basic skills and learn facts that is based on the scoring of basketball: “You will work in pairs on one of two teams. Each player will earn 2 points for a correct answer, 1 point for a corrected answer, and 0 points for an uncorrected answer. Each point you earn will help your team meet its goal of earning the most points in a week.” The class discussed the importance of showing good sportsmanship whatever the competition’s outcome. Next, the investigator facilitated tutoring practice by showing how to pair up quickly and efficiently, demonstrating proper tutoring interaction with a student at the overhead projector, challenging two students to model what they just saw, and providing whole-class practice with specific feedback (see Appendix F for specific tutoring procedures in flowchart form, modified from that of Cheung and Winter {1999}). Math content for the training session was basic multiplication facts (e.g., $7 \times 9 = 63$). Finally, the class practiced closure activities—point reporting, point sheet cleaning, and moving back to seats.
For the CWPT – CR group (i.e., students not receiving competitive reinforcement), the investigator introduced CWPT as a way to practice basic skills and learn facts in pairs: “You and your partner will help each other learn how to solve bigger multiplication problems. You will be not only a student, but also a teacher, who gets to use an answer key and other tools to support your partner’s work in math!” Excepting discussion about teams and point earning, CWPT – CR training was identical to that of CWPT + CR (see Appendix F’s flowchart, where asterisks mark competitive reinforcement procedures not found in CWPT – CR).

Once both student groups completed their training, the investigator launched the multiplication unit. A typical math period for the CWPT + CR class began with a review of previous material. The investigator then introduced and taught the new lesson, led the class through several practice problems, and checked for individual understanding. The investigator next utilized the Pairs Chart to orient the teams and identify the assignment. Pairs received answer keys and a reminder to refer to the Skills for Tutors and Tutees chart throughout the session. Once all materials were ready, the investigator set the timer for 10 minutes, and the pairs began the assignment, switching roles when the timer went off. While the students worked, the investigator walked around to observe, answer questions, and record bonus points for proper tutoring behavior. When the timer went off a second time, the investigator shared observations and bonus points for pairs to record on their point sheets. One member of each pair cleaned/handed in/put away materials while the other member reported points earned by the pair to the investigator. The investigator posted team totals on the Team Point Chart and led the class in giving
“bravo gestures” to the winning team for their point earning and to the losing team for their effort.

Halfway through the unit (i.e., after Lesson 4), the investigator added up accumulated team points and announced a grand winner. Winning team members received both a “bravo gesture” and a flagged pencil. New pairs and teams then formed for the second half of the study.

A standard math period for the CWPT – CR group entailed all of the above except for the competitive point components. Student pairs neither worked on teams nor recorded points. The investigator observed and assisted pairs but did not record bonus points. At the end of a session, the investigator shared observations and asked the class to hand in/put away their tutoring materials. Midway through the study, new pairs formed.

Complementing investigator observance during tutoring sessions, one process variable, the amount of content covered, served as an indirect measure of both student groups’ engagement in CWPT. The content coverage variable was operationalized as the number of math problems solved correctly on paper by the end of each session.

In addition to completing daily assignments in pairs, all students independently took three cumulative quizzes interspersed throughout the unit. Students participating in CWPT + CR earned three points for each correct response, and these quiz points counted toward weekly team totals. Students from both classes who earned unsatisfactory quiz scores corrected their work, receiving assistance if necessary. Since the investigation took place in a natural classroom setting and the investigator was theoretically available to all participants, the potential confound of this intervention was distributed across all subjects.
This study does not report any daily assignment or quiz scores.

After the third quiz, which served as a chapter review, students in both groups individually completed a written posttest and math interest questionnaire. Concerning the posttest, the investigator calculated average pretest and posttest scores for each student and both groups in order to determine academic growth. As for the questionnaire, it was identical to the one used at the beginning of the study to measure participants’ intrinsic interest in math.

Results

Academic Growth in Math

The two student groups performed similarly on the multiplication pretest. The average pretest scores for the CWPT + CR group and CWPT – CR group were 39.3% and 38.1%, respectively. A t-test confirmed a nonsignificant difference ($t = 0.23$, $df = 44$, $p = 0.82$). (See Table 1 for pretest and posttest scores.)

T-tests (dependent samples, comparing pretests and posttests) showed that both forms of CWPT led to academic gains in math (see Figure 1). The CWPT + CR group improved significantly ($t = 14.04$, $df = 21$, $p < 0.0001$), with an average posttest score of 88.0% (an average gain of 48.7 percentage points). The CWPT – CR group also showed significant improvement ($t = 18.55$, $df = 23$, $p < 0.0001$), with an average posttest score of 86.2% (an average gain of 48.1 percentage points).

While the average math gains of the CWPT + CR group were arithmetically larger than those of the other group (by 0.6 percentage points), a t-test (independent samples, examining group differences in pretest to posttest gains) showed that the group
difference was nonsignificant ($t = 0.13, df = 44, p = 0.90$). The group difference in
posttest scores also was nonsignificant ($t = 0.56, df = 44, p = 0.58$).

**Intrinsic Interest in Math**

The two CWPT groups responded similarly on the math interest pretest. The
mean interest scores for the CWPT $+$ CR group and CWPT $-$ CR group were 46.00 and
46.67, respectively (the higher the score, the higher the interest, the range being 15.00 –
75.00). A t-test verified a nonsignificant difference ($t = 0.17, df = 44, p = 0.86$). (See
Table 2 for pretest and posttest scores.)

T-tests (dependent samples, comparing pretests and posttests) showed that the two
forms of CWPT had no significant effect on the students’ interest in math (see Figure 2).
The mean posttest score for the CWPT $+$ CR group was 45.81, a drop of 0.18 ($t = 0.14,$
df $= 21, p = 0.89$). The CWPT $-$ CR group’s mean posttest score was 46.33, a drop of
0.33 ($t = -0.24, df = 23, p = 0.81$).

**Process Variable**

Regarding the content coverage variable, the two groups showed no significant
difference in the eight lessons’ content amount (see Figure 3). Independent t-tests
confirmed the lack of significance (see Table 3).

**Discussion**

This study’s statistical results indicate that CWPT is a valid instructional strategy
for use within a fourth-grade multiplication unit. Concerning academic growth, both
forms of CWPT led to improved math performance; each group made significant pretest
to posttest gains. According to the content coverage data, traditional CWPT’s use of a
group contingency did not promote a higher rate of on-task behavior in the CWPT $+$ CR
group; both classes covered the same amount of material. Regarding intrinsic interest, the questionnaire data shows no clear evidence of the “overjustification effect.” While the CWPT + CR group’s attitude towards math did arithmetically drop slightly at posttest, the other group performed similarly, and the drops were not statistically significant. (The children’s on-task behavior and attitude towards math are addressed further later in the context of investigator observations and interactions with students.)

Several limiting factors must be considered when interpreting this investigation’s results. First, the study was small-scale. Incorporating only 46 students from 2 intact fourth-grade classrooms within a single school limits the results’ generalizability. Second, the 17-day study was short-term. Similar studies conducted over a longer period of time might more clearly indicate the impact competitive reinforcement has upon students’ academic growth and intrinsic interest in math. Related to the second factor is a third concern—the administration of the Attitude Toward Mathematics Scale posttest so soon after the pretest (16 class periods later). Since the questionnaire forms were identical, the pretest could have influenced posttest results (Crowl, 1996). Regarding use of self-report measures in general, Kohn (1993) points out that participants do not always accurately describe their feelings. For example, participants may record responses they feel will most please the investigator.

In spite of the above limitations and a lack of statistical significance regarding group differences, this action research project affirmed the investigator’s belief that CWPT can be an asset in a Christian, collaborative classroom. This affirmation emerged through observation and interaction with student participants during the study.
CWPT promotes a collaborative environment in its shift away from passive, individual work to active, partner learning. During the study’s debriefing, a CWPT + CR student said, “CWPT helps you learn multiplication and have fun with friends,” and a CWPT – CR student stated, “CWPT helps you get along with people who would not normally be your friends.” God created people with a social dimension; therefore, children need opportunities to interact with fellow-learners. Another CWPT – CR student identified some of the academic benefits of peer interaction: “Solving [multiplication problems] out loud makes you catch mistakes quickly. You get to see someone else working. You learn from others’ mistakes.”

Related is the program’s incorporation of immediate peer feedback. One CWPT + CR child said, “CWPT makes you smarter because your tutor asks you to fix problems.” A classmate noted, “If you get a problem wrong, your tutor will help you get it right.” CWPT utilizes students as a valuable resource, allowing them to see that the teacher is not the only person with answers. One prerequisite for a collaborative classroom is a setting in which students function as teachers (Van Dyk, 2000).

The provision of immediate peer help/feedback promotes on-task behavior. A CWPT – CR student declared, “I like to work with other people; I do not have to raise my hand.” The investigator noted few instances where children raised their hands and waited for teacher assistance. Occasions where the investigator observed off-task behavior in both student groups (e.g., looking around the room, doodling on the point sheet, engaging in small talk) were the exception rather than the norm. A high level of academic talk (e.g., question asking/answering) nurtures students to be wise stewards of time.
While on-task behavior, peer feedback, and a social learning environment are necessary components of a Christian, collaborative classroom, CWPT’s use of competitive reinforcement warrants program modification. This study confirmed the investigator’s concerns regarding the program’s impact on classroom atmosphere, perception of peers, and learning focus.

Regarding classroom atmosphere, fear of failure is often evident within a competitive environment (Van Dyk, 2000). Upon learning that CWPT + CR students earn team points based on a 10-minute performance, one parent felt that her son would collapse under the time pressure. Carefully observed by the investigator and supported by sensitive partners, the child performed well, but his mother’s concern was a valid one. During the study’s debriefing, one of the boy’s classmates stated that she felt CWPT was fair because “we all get the same amount of time.” What this child did not consider, however, is the fact that some students need more time to be successful learners. A collaborative classroom is not time-constrained.

Van Dyk (2000) also states that fear of others is apparent in competitive settings. Another parent expressed worry over her son’s math assignments and scores being “on display” in the CWPT + CR setting. Her son was sensitive about his mathematical ability and how others would perceive his progress. When CWPT + CR pairs reported point earnings at the end of each session, the investigator noted several other students’ anxiousness as they shared scores lower than others. Christian teachers must do all they can to prevent classroom participants from worrying about how well they are doing in comparison to others.
Closely associated is the concern that students often perceive peers—even partners on the same team—as obstacles to personal success in traditional CWPT. In Lesson 8, a CWPT + CR student announced that “being a tutor is boring” after the investigator talked to him about patiently assisting his tutee, who was having difficulty with multiplying three factors. This tutor, realizing that he and his partner were not going to earn all that many points because of the tutee’s slow progress, saw his peer as a barrier to the prize and lost interest in the proceedings. Such a perspective counters a collaborative classroom in which students feel secure, safe, accepted, and mutually supported (Van Dyk, 2000).

A standard CWPT program can devalue not only people but also the learning process itself. CWPT’s use of a group contingency to promote on-task academic behavior frames learning as “something one does in exchange for a prize rather than as something intrinsically valuable” (Kohn, 1993, p. 23). At the end of the first CWPT + CR lesson, the investigator overheard one pair ask another, “How many points did you two earn today?” Also observed were several students using the transparency point chart to quickly add up team points upon hearing that the class period’s time had run out. When a CWPT + CR student saw a peer fixing the third quiz, he asked the investigator if he had to fix his paper too, adding, “I do not want to fix my quiz unless it helps me get more points for my team!” Kohn explains that when people strive for a reward, they do only what is necessary and no more. At the end of the study, one CWPT + CR child expressed frustration over never winning a flagged pencil even though he had consistently done excellent math work. The focus in these four situations was the extrinsic reward rather than academic and social growth.
Contrast these instances to a situation in a CWPT – CR lesson where the students chose calculation methods based on problem difficulty. One student decided to forego calculator use in favor of either mental math or paper and pencil. The fact that he did not complete as many problems as his peers did not bother this child; rather, he took delight in learning for its own sake. Responding to their God-given rationality, children possess a natural proclivity towards learning as they discover and play around with creation (Fennema, 1997). Extrinsic reinforcers (i.e., points and flagged pencils) were not able to distract this boy from searching for and overcoming an academic challenge.

However, use of extrinsic reinforcement did sidetrack the investigator in the CWPT + CR setting. While walking around as the pairs worked, the investigator found that having to evaluate tutoring behavior in order to determine bonus points got in the way of assessing academic progress and building caring relationships with the children. Moving from one pair to another, the investigator sometimes heard a child whisper, “The teacher is coming!” When observed to check for performance or compliance, people view the observer as a controlling force (Kohn, 1993). Announcing bonus points at the end of each session, recording and adding team points, and passing out flagged pencils at the end of each round also forced the investigator into an unwanted managerial role.

The investigator desires a classroom setting where both teacher and students do their best work—not as a response to extrinsic reinforcement but out of a heartfelt desire to serve God and one another. Eliminating competitive reinforcement from CWPT is one avenue toward responsive discipleship. The investigator will continue to carefully consider research findings and make necessary modifications to honor personal
educational philosophy and experiential knowledge. Meanwhile, researchers and teachers must work together to bridge the gap between research and practice.

The investigator recommends additional Classwide Peer Tutoring research in several areas. One possibility would be to manipulate CWPT components other than competitive reinforcement and note the effects. For example, what effects would lengthening the tutoring sessions have on students’ academic growth and/or intrinsic interest? In math, more complicated algorithms require more time to solve, so practitioners might be tempted to lengthen the two 10-minute work periods/day. A second possibility centers on learning retention: which form of CWPT (i.e., CWPT + CR or CWPT – CR) best helps students maintain their learning? Additional research might explore the use of different types of praise reinforcement in a peer tutoring context. Researchers have not come to a consensus regarding the relationship between praise and intrinsic interest. Also warranted is a closer look at the relationship between intrinsic interest and motivation, the latter which the investigator set aside for the purposes of this particular study. A child may possess intrinsic math interest but not be motivated to work in a particular math setting. This distinction is not always clear in the research literature.
References


Appendixes
Appendix A

Timeline for Action Research

Day 1: Administer Math Interest Questionnaire.
Day 2: Give Chapter 5 Pretest.
Day 3: Train classes in CWPT.
Day 4: Teach first lesson: “Exploring Multiplication Patterns.”
Day 6: Give Section A Quiz.
Day 7: Teach third lesson: “Multiplying 2-Digit Numbers.”
Day 8: Continue third lesson: “Multiplying 2-Digit Numbers.”
Day 9: Teach fourth lesson: “Multiplying 3-Digit Numbers.”
Day 10: Teach fifth lesson: “Choosing a Calculation Method.”
Day 11: Give Section B Quiz.
Day 12: Teach sixth lesson: “Multiplying Money.”
Day 13: Teach seventh lesson: “Mental Math: Special Products.”
Day 14: Teach eighth lesson: “Multiplying 3 Factors.”
Day 15: Give Section C Quiz.
Day 16: Give Chapter 5 Posttest.
Day 17: Administer Math Interest Questionnaire.
Appendix B
Math Pretest and Posttest

Chapter 5: *Multiplying by 1-Digit Factors*

Pretest

Name: ____________________________  #

Date: ____________________________

Score: __________

In 1-3, match each vocabulary word with its meaning.

1. product  
   a. data arranged in rows and columns

2. array  
   b. multiplication answer

3. factor  
   c. number being multiplied

In 4-5, use a multiplication fact to help you find each product.

4. $8 \times 20$

5. $9 \times 70$

In 6-7, use patterns to find each product.

6. $7 \times 3 = _____ \quad 7 \times 30 = _____ \quad 7 \times 300 = _____$

7. $5 \times 6 = _____ \quad 5 \times 60 = _____ \quad 5 \times 600 = _____$

In 8 – 10, estimate each product.

8. $4 \times 91$

9. $48 \times 6$

10. $3 \times 76$
11. Use the array to help you find the product.

\[
\begin{array}{c}
17 \\
x 4
\end{array}
\]

In 12-13, find each product. Estimate to check your work.

12. \( 5 \times 22 \)

13. \( 67 \times 3 \)

In 14-19, multiply.

14. \( 417 \times 9 \)

15. \( 307 \times 6 \)

16. \( 8,005 \times 3 \)

17. \( 8,208 \times 3 \)

18. \( \$3.75 \times 5 \)

19. \( \$16.41 \times 6 \)

20. Use mental math to find the product.

\( 5 \times 52 \)

21. Write \( 4 \times 7 \times 5 \) in three different ways. Then solve.

22. Explain how multiplying money amounts is like multiplying whole numbers.
Chapter 5: *Multiplying by 1-Digit Factors*

Posttest

Name: ___________________ # ___

Date: __________________

Score: ______

In 1-3, match each vocabulary word with its meaning.

1. regroup a. data arranged in rows and columns
2. product b. to name a number in a different way
3. array c. multiplication answer

In 4-5, use a multiplication fact to help find each product.

4. 4 x 90

5. 7 x 300

In 6-7, use patterns to find each product.

6. 9 x 3 = ________
   9 x 30 = ________
   9 x 300 = ________

7. 8 x 5 = ________
   8 x 50 = ________
   8 x 500 = ________

In 8-10, estimate each product.

8. 6 x 82

9. 57 x 6

10. 3 x 48

11. Use the array to help you find the product.

   14  
   x 3  

   ________
   ________
   ________
   ________
In 12-13, find each product. Estimate to check your work.

12. 46 x 4
13. 8 x 56

In 14–19, multiply.

14. 328
   \[ \times 7 \]
15. 502
   \[ \times 7 \]
16. 7,060
   \[ \times 9 \]
17. 3,405
   \[ \times 6 \]
18. $6.30
   \[ \times 7 \]
19. $14.24
   \[ \times 8 \]

20. Use mental math to find the product.

   49 \times 5

21. Write 2 \times 9 \times 5 in three different ways. Then solve.

22. Explain why you put a decimal point in your answer when you multiply money amounts.
Appendix C

Math Intrinsic Interest Questionnaire

Attitude Toward Mathematics Scale (Peterson, 1978)

INTERESTS ABOUT MATH

We . . . want to know how interested people are about various things in math. On the following four pages are statements like these:

I like warm sunny days.

Strongly Agree     Agree     Don’t Care     Disagree     Strongly Disagree

Please check the answer that tells best how much you agree or disagree with each statement about yourself. For example, if you really like warm sunny days, you’d put a check (√) on the line above strongly agree. If you don’t really care about warm sunny days, you’d put a check (√) on the line above don’t care.

There are no right or wrong answers for these exercises. They simply tell how you feel.

Ready?

BEGIN ON THE NEXT PAGE
1. Math is a waste of time.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

2. Math is interesting.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

3. I think math classes are too long.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

4. I like anything that has to do with math.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

5. I like to spend a lot of time answering math problems.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

6. I like math books more than any kind of book.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

7. I could do very well without math.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

8. Math is a good subject.

   Strongly Agree    Agree    Don’t Care    Disagree    Strongly Disagree

GO ON TO THE NEXT PAGE IMMEDIATELY
9. I am not interested in math.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

10. I would enjoy going to school during the summer if I could study math.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

11. If it has to do with math, forget it! I hate math!

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

12. I would like to work where I can use math when I grow up.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

13. There are lots of things I’d rather do than study math.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

14. I can hardly wait for math class every day.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

15. I only take math class because I have to.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Don’t Care</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
**INTERESTS ABOUT MATH – Scoring Key**

<table>
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<tr>
<th>Response</th>
<th>Score</th>
<th>Items</th>
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</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
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<td>2, 4, 5, 6, 8, 10, 12, 14</td>
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<td>Agree</td>
<td>4</td>
<td></td>
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<tr>
<td>Don’t Care</td>
<td>3</td>
<td></td>
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<tr>
<td>Disagree</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>1</td>
<td>1, 3, 7, 9, 11, 13, 15</td>
</tr>
<tr>
<td>Agree</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Don’t Care</td>
<td>3</td>
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</tr>
<tr>
<td>Disagree</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Higher score indicates more positive attitude.
Appendix D
Sample Custom-Made CWPT Materials

### Pairs Chart (for CWPT + CR)

<table>
<thead>
<tr>
<th>Team:</th>
<th>Skill</th>
<th>Team:</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Skills for Tutors and Tutees**

**Ground Rules:**
1. Ask for help if needed.
2. Show respect and support.

**Active Listening:**
1. Look at each other.
2. Lean in.
3. Smile and nod.

**Ignoring Distractions:**
1. Count to five.
2. “I won’t look” or “I will keep working” or “I’ll come back.”

**Giving Compliments:**
1. Be specific.
2. Use a pleasant face and voice.

**Receiving Compliments:**
1. “Thank you.”
2. Use a pleasant face and voice.

**Tutoring Sounds Like:**
1. 6-inch voice
2. on-task voice
3. “put-ups”
4. asking/answering questions

### Team Point Chart (for CWPT + CR)

<table>
<thead>
<tr>
<th>Team</th>
<th>Team</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

**Point Sheet (for CWPT + CR)**

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>12</th>
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<td>92</td>
<td>93</td>
<td>94</td>
<td>95</td>
<td>96</td>
</tr>
</tbody>
</table>
| 97| 98| 99| 100|...

**Directions:**
1. Award 2 points for each problem your partner does correctly on the first try.
2. Award 1 point for each problem your partner fixes on the second try.
3. Award 0 points for each problem your partner does not fix on the second try.
4. Remember that you can earn bonus points for proper tutoring behavior.
Appendix E

Consent Form

______________, 2002

Dear Parents of Fourth Graders,

To fulfill the requirements for Dordt College’s M.Ed. degree in Curriculum and Instruction, I plan to conduct an action research project in Ripon Christian’s two fourth-grade classrooms. My topic is Classwide Peer Tutoring (CWPT), a structured program in which students work in pairs on two teams to practice basic skills and learn facts.

I have used CWPT in fourth-grade math for the past eight years. While pleased with the program’s emphasis on students helping students to learn, I have modified CWPT to downplay its competitive side (i.e., two teams competing for math points). However, I made these changes without considering their impact on students’ growth and interest in math. In my study, therefore, I would like to systematically explore the effects of two versions of CWPT.

Having received Miss Jacob’s permission, I will teach a three-week unit on Chapter 5 in the math book to both 4A and 4B. One class will participate in traditional CWPT while the other incorporates a modified version. After the chapter posttest, Miss Jacobs and I will make sure that students who struggled with the content receive extra help.

I would greatly appreciate your support for my research project. Please complete the form below and return it via your child by _________________. Thank you!

Sincerely,

Dale De Weerd
[ ] I give permission for ____________________________ to participate in Mr. De Weerd’s research project.

[ ] I do not give permission for ____________________________ to participate in Mr. De Weerd’s research project.

__________________________________________________________________________________________

(child’s name)

__________________________________________________________________________________________

(child’s name)

__________________________________________________________________________________________

(parent’s signature) (date)
Appendix F

Classwide Peer Tutoring Procedures

TE records problem from assigned page.
TE solves problem out loud.
TR watches both answer key and TE's work.

If TE's answer is correct:
TR may praise TE.
TR prompts TE with "Go on."
TR records 2 points on point sheet.*

If TE's answer is incorrect:
TR prompts TE to "Please fix."

TE reworks problem out loud.

If TE's answer is correct:
TR may praise TE.
TR records 1 point on point sheet
(only if TE corrects on first attempt).*

If TE's answer is incorrect:
TR provides one clue/assist.
TR prompts TE to "Please fix."

Note 1: TR = tutor and TE = tutee.

Note 2: * = tutoring procedure for CWPT + CR only.

Note 3: TR and TE exchange roles after 10 minutes.
<table>
<thead>
<tr>
<th>Class</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
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<td>34</td>
<td>98</td>
<td>64</td>
</tr>
<tr>
<td>4A</td>
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Table 2
Intrinsic Interest Questionnaire Pretest and Posttest Scores

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<th>Posttest</th>
<th>Difference</th>
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Table 3

Independent t-Tests for Content Coverage Variable

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<td>“Estimating Products”</td>
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<td>0.95</td>
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<td>“Multiplying Money”</td>
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Figure 1

Academic Gains in Math

Math Performance

Average Percent Correct

0 10 20 30 40 50 60 70 80 90 100

CWPT + CR

CWPT - CR

Groups

Pretest
Posttest

CWPT + CR: 22 students
CWPT - CR: 24 students
Figure 2

Interest in Math

Intrinsic Interest

GroupCWPT + CR: 22 students
CWPT - CR: 24 students
Figure 3

Content Coverage

Lesson 1: "Exploring Multiplication Patterns"

- CR: 22 kids
- CR: 23 kids

Lesson 2: "Estimating Products"

- CR: 22 kids
- CR: 24 kids

Lesson 3: "Multiplying 2-Digit Numbers"

- CR: 20 kids
- CR: 24 kids

Lesson 4: "Multiplying 3-Digit Numbers"

- CR: 20 kids
- CR: 24 kids

Lesson 5: "Choosing a Calculation Method"

- CR: 21 kids
- CR: 23 kids

Lesson 6: "Multiplying Money"

- CR: 21 kids
- CR: 24 kids

Lesson 7: "Mental Math: Special Products"

- CR: 21 kids
- CR: 24 kids

Lesson 8: "Multiplying 3 Factors"

- CR: 20 kids
- CR: 24 kids
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Professional Clear Multiple Subject Teaching Credential