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An Examination of Collaborative Learning Assessment through Dialogue (CLAD) in Traditional and Hybrid Human Development Courses

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Abstract

This investigation assessed the effectiveness of using Collaborative Learning Assessment through Dialogue (CLAD) (Fitch & Hulgin, 2007) with students in undergraduate human development courses. The key parts of CLAD are student collaboration, active learning, and altering the role of the instructor to a guide who enhances learning opportunities. The effectiveness of this approach was explored in both hybrid formats where classes reduce face-to-face meeting time by incorporating on-line activities and traditional course formats, such as lecture. A sample of 169 students completed courses in human development either using CLAD or using traditional techniques that provided more direct instruction. In addition, some of the classes were taught in a hybrid format. In two of the comparison group subsets, students in the CLAD group demonstrated significantly higher final grades. Hybrid course formats resulted in higher student achievement as well. These results provide preliminary support for the use of CLAD and hybrid formats in higher education settings.

Previous research has indicated that cooperation in academic settings is more conducive to student achievement than competitive or individual efforts (Johnson, Johnson, & Smith, 2007). Johnson and Johnson (1989) reported that cooperative efforts in the classroom result in greater student achievement, greater retention of course material, more use of critical thinking and meta-cognition, greater transfer of learning, and improved problem-solving abilities. The concept of students working together has been discussed in the literature by two similar but distinct approaches: cooperative learning and collaborative learning. Fitch and Hulgin (2007) indicated that cooperative learning and collaborative learning have five characteristics in common. Both approaches involve a common learning activity designed for groups, cooperative behavior, positive interdependence, a small-group learning structure, and accountability and responsibility on the part of the individual.

While cooperative learning and collaborative learning appear to have much in common, they emanate from different theoretical backgrounds. The term cooperative learning is associated with the work of Johnson and Johnson (1989, 1994). According to Johnson and Johnson (2006), cooperative learning is based on social interdependence theory. Social interdependence exists in groups when members' outcomes are affected by the actions of the other group members. The theory evolved from Gestalt psychology and Lewin's Field Theory. Deutsch (1949) was the first to formally describe social interdependence theory and he indicated that group members' actions can be positive or negative. That is, group members can aid each other in attaining group goals or they

can hinder goal attainment. Collaborative learning, however, is born out of the socio-cultural theories of Vygotsky (1978), Rogoff (1990, 1998) and Wertsch and Toma, (1995). The defining characteristic of collaborative learning is the co-construction of shared meaning through discussion, which is absent in cooperative methods (Fitch & Holguin, 2007).

CLAD (Collaborative Learning Assessment through Dialogue)

CLAD is based upon Vygotsky's (1978) socio-cultural theory which views learning as a social process. The CLAD method views social interaction as a critical component of cognitive development. The basic assumptions of CLAD are that learning is social; cognitive conflict (referring to the Piagetian concept of disequilibrium where one is faced with concepts that challenge current knowledge and require a transformation of schemas) (Piaget, 1926) is essential to the learning process; individuals are more likely to evaluate and change their ideas during peer-driven dialogue; and immediate feedback is essential to the learning process (Fitch & Hulgin, 2007). CLAD has three primary components: working in teams to complete a series of true/false study questions; group quizzes; and immediate feedback. The true/false study questions are designed to facilitate student dialogue, critical thinking, and cooperation. The group quizzes are used because dialogue among peer group members is thought to be a critical component of cognitive development (Johnson & Johnson, 1994; Verba, 1993). According to Fitch and Hulgin (2007), the CLAD method is designed to bring forth cognitive conflict as a means of attaining the highest

levels of learning. Quiz questions, therefore, should cause high levels of dialogue and problem solving among group members. The group quizzes are designed so that students receive immediate feedback, allowing better understanding of the material before moving to the next topic. Immediate, corrective feedback is thought to be essential for academic achievement (Bloom, 1976; Levin & Long, 1981).

These components of CLAD allow for the use of structured collaboration and cognitive conflict in the classroom which, in turn, leads to academic and interpersonal benefits (Johnson, Johnson, Pierson, & Lyons, 1985). Academic benefits associated with the use of collaborative learning include higher quality reasoning, greater achievement and retention, more frequent creative insight better problem solving, and decision making, greater sharing of expertise, greater task involvement, and positive attitude change (Fitch & Hulgín, 2007).

Given that the CLAD method was recently found to be highly effective in elementary settings (Hulgín & Fitch, 2007) and Johnson, Johnson and Smith (2007) reported that cooperative techniques are an accepted and preferred method of instruction at all education levels, this study explored the application of CLAD to a college student population. Collaborative methods promote active learning and social interaction, two key factors of high achieving classrooms (Hulgín & Fitch, 2007). While collaborative methods have been shown to be beneficial at all educational levels, little if any work has examined the use of collaborative methods in blended formats such as hybrid courses. One of the purposes of the present research is to address this gap in the literature. Thus, the effectiveness of collaborative learning will be examined in hybrid courses as well as in more traditional classroom settings. It is hoped that a combination of collaborative learning and hybrid formats will be successful in term of student achievement in the classroom.

Hybrid Formats

Blended, or hybrid, classes combine traditional classroom learning with distance education (Williams, 2002). Specifically, in the hybrid classroom seat time is reduced and replaced with assignments using an online format (Vaughan, 2007). Arabasz, Boggs, and Baker (2003) found that about 80% of higher education institutions offered hybrid courses, a number that has likely increased since that time. Hybrid courses have become substantially more popular due to the increased use of web tools such as Blackboard. Recently, there has been a push in recent years for colleges to offer online or distance learning courses due to the growing number of students who have both work and family commitments that make the time flexibility of online courses especially attractive (Vaughan, 2007).

Research on the effectiveness of distance education has produced mixed and confusing results. Tallent-Runnels et al. (2006) reviewed research on online education and

stated that empirical findings were less prevalent than anecdotal and descriptive findings, but that learning outcomes were comparable to traditional methods, and students liked working at their own pace. However, the effects of blended learning formats have not been extensively studied at this time although some preliminary findings are favorable. For example, according to Vaughan's (2007) review of existing research on blended or hybrid courses, improved learning outcomes and student preference surveys have supported the use of a blended format. Specifically, students gain flexibility with class time while still maintaining personal contact with instructors.

Garnham and Kaleta (2002) surveyed students about their attitudes toward hybrid courses. The majority of students who participated indicated that they could control the pace of their own learning, were better able to organize their time, and felt that there should be more hybrid courses offered at the university. Aycock, Garnham and Kaleta (2002) added to the favorable findings by reporting that 80% of students who took a hybrid course at the University of Wisconsin, Milwaukee said the experience was positive and that they would suggest such a course to others. After reviewing studies on learning outcomes associated with hybrid or blended learning courses, Vaughan (2007) concluded that hybrid courses have higher academic success rates (as measured by the number of students obtaining a C or better in the class) and lower withdrawal rates than courses with non-hybrid formats. Vaughan also stated that student retention in hybrid courses is better than in online courses and similar to the retention rates associated with traditional courses.

From a faculty perspective, there seems to be a high level of satisfaction with the hybrid format. Faculty report enhanced teacher-student interaction, increased student engagement in learning, flexibility of the teaching and learning environment, and opportunities for continuous improvement with blended formats (Aycock et al., 2002). In summary, it would appear that hybrid formats are superior to traditional classroom formats in terms of student achievement (Vaughn, 2007) and faculty satisfaction.

A review of research on teaching methodology seems to support the use of nontraditional approaches, such as collaborative learning and Hybrid models, over traditional lecture methods. In this study we not only wanted to test that assumption, but also wanted to explore combinations of nontraditional methods. We designed a series of studies to determine if one specific form of collaborative learning (CLAD) is effective in college level human development courses taught in several formats. We proposed four main hypotheses based on the literature:

1. Students in CLAD classrooms will have higher academic achievement as assessed through course grades than students in traditional classrooms.
2. Students in CLAD Hybrid classrooms will have higher academic achievement than students in CLAD non-hybrid classrooms.

3. Students in CLAD Hybrid courses will have higher academic achievement than students in hybrid courses.
4. In addition to improved academic performance, students in CLAD classrooms will view collaborative methods as effective.
5. Students in the hybrid course will have higher academic achievement than students in the traditional course.

Study 1: Child Development

Method

Participants

A sample of 94 students enrolled in one of four courses participated in the first study. The traditional Child Development course had 14 participants (mean age = 28), with 13 of the participants being female (93%) and 13 being White (93%). The CLAD Child Development course was much larger with 28 participants, but similar in terms of age (mean age = 27). Of the 28 participants in our sample, 26 were female (93%) and 27 White (96%). The hybrid Child Development course consisted of 14 participants (mean age = 23), who were all White with 12 (86%) being female. Lastly, the combined CLAD - Hybrid Child Development course had 38 participants who were again all White with 30 females (79%) (mean age = 22).

Procedure

Participants were enrolled in one of the human development courses taught by the first author over 2 years. The fundamental difference between all four courses was in the use of the CLAD process and hybrid formats. One was taught in a traditional manner, where lecture and other direct instructional techniques were the primary method of instruction. The second course used a CLAD model of instruction. The third was taught in a hybrid fashion, where in-class sessions were lecture based, but there was also a web-based component. The fourth course used CLAD in a hybrid format. In all classes, student academic achievement was assessed using course grades. Since the purpose of our study was to examine the overall effectiveness of CLAD in terms of student achievement, we did not focus on specific aspects of the CLAD process in this research. Thus, students in CLAD classrooms had more assignments than students in the traditional or hybrid classrooms. In addition, students completed attitudinal surveys assessing their perceptions of the CLAD process, collaborative learning, and the effectiveness of common classroom teaching techniques.

The steps involved in CLAD are as follows:

1. Students are provided with an Anticipation Guide (AG) which is an advanced organizer consisting of a series of true/false items designed to direct the student's reading and compare his or her pre-reading assumptions and experiences with the text information. Individual students make predictions about the text then mark their predictions on an (AG) before they do the reading.

2. Students confer with their group and come to consensus on the probable answers to the AG items also prior to reading the text.
3. Students then go home and individually read the text, indicating on the AG where they found evidence supporting or disconfirming the question.
4. At the next class meeting, students complete and submit an individual quiz on the reading.
5. After the individual quiz, students break down into their small groups to go over the AG and reach a consensus on the correct answer for each item and the location of the evidence.
6. At the next class meeting, the class comes back together and discusses the anticipation guide. The class works together to reach a consensus on the correct answers for each of the items. During this time the instructor does not give the answers to the class, but merely acts as a discussion facilitator.
7. Finally, the groups take the group quiz on the reading. All members of the group receive the same score. Group members must reach a consensus before choosing an answer. Any disagreement allows for constructive conflict. Answers are marked on an immediate feedback quiz using color changing markers. This quiz is precoded by the instructor such that the correct answer is evident by a certain color, and incorrect answers are indicated by a different color. Students are allowed to continue trying to get the answer correct, although for a lower number of points. For example, the question is worth 3 points if answered correctly the first attempt, 2 points for the second attempt, 1 point for the third attempt, and no points for the final attempt if a 4-choice format is being used.

Overall, the self-correcting group quiz is at the heart of CLAD. Bloom (1976) asserted that corrective feedback is important to academic achievement. Students need to know how to correct themselves as they learn. The instructor's role in this process is to make sure that there is equal participation, debate, and discussion towards consensus and mutual understanding. The instructor also acts to provide guidance when consensus is not possible, or to encourage further discussion when the students are incorrect.

In courses with a combined CLAD - hybrid format, individual aspects of the CLAD process were completed online by students through Blackboard. For example, students went on to Blackboard to get the anticipation guide and to take individual quizzes. In straight hybrid formats students went online to complete chapter quizzes and critical thinking assignments.

Results

In order to ascertain the effectiveness of traditional classroom methods, CLAD, and Hybrid formats, an ANOVA was performed with pedagogy as the independent variable and student achievement as the dependent variable. Student achievement was measured with final course grades. Because

unequal group sizes often affect the ANOVA assumption of homogeneity of variances, Levene's test of homogeneity of variance was computed, The test was not significant at the .05 level, indicating that the ANOVA's homogeneity of variance assumption had not been violated Cell means and standard deviations can be found in Table 1.

Table 1
Means and Standard Deviations for Type of Pedagogy and Student Achievement

Pedagogy	N	M	SD
Child CLAD Hybrid	38	91.26 _b	11.37
Child Hybrid	14	88.01 _{ab}	19.35
Traditional Child	14	81.33 _a	11.61
Child CLAD	28	92.88 _b	5.93

Note: Means with different subscripts differ significantly.

The effect of pedagogy was statistically significant, $F(3, 91) = 3.82, p < .05$. Tukey post hoc analyses were performed to identify specific differences in student performance across the various pedagogies. The traditional classroom method was significantly less effective than the combination CLAD - Hybrid classroom ($p < .05$) and the CLAD classroom ($p < .01$). There were no significant differences between student performance in the CLAD, Hybrid CLAD, or Hybrid classrooms.

In each course students were asked to fill out a survey assessing their impressions of the effectiveness of collaborative learning and traditional classroom methods. Most students in the CLAD classrooms rated various aspects of the CLAD format (e.g., anticipation guides, individual quizzes, and weekly group quizzes) as either effective or very effective in terms of their learning (See Table 2). In addition, students in the Hybrid class rated online quizzes as effective or very effective in regard to their own learning (90%) as did students in the Child CLAD Hybrid class (96.4%).

Table 2
Participants Ratings of Effectiveness of Collaborative Methods

Pedagogy	Collaborative Method		
	Anticipation Guides	Individual Quizzes	Group Quizzes
Child CLAD	96.4%	96.4%	89.2%
Child CLAD Hybrid	100%	96.4%	100%

Note: Participants ratings of effectiveness are depicted here as the percentage of participants rating the collaborative method as either effective or very effective.

Discussion

Students in CLAD and Hybrid formats, or a combination of the two, performed significantly better than students in a traditional classroom. It would appear that the use of

collaborative methods in the classroom promotes student achievement. The introduction of a hybrid format also seems to enhance student achievement. In addition, students in CLAD classrooms felt that collaborative teaching methods were highly effective in enhancing their learning. The use of online quizzes was viewed by students as an effective method of instruction in the hybrid classrooms.

Future work is needed to determine the conditions under which the CLAD process is most effective. The classes in this study were all Child Development courses. It would be useful to know whether or not students respond to CLAD and combined CLAD - hybrid formats in other courses. Our next study will examine this question in Adult Development classroom.

Study 2: Adult Development

The results of study 1 indicate that CLAD and combined CLAD - Hybrid formats are beneficial in terms of student performance. In addition, it seems that the majority of participants believed that the use of CLAD and CLAD - hybrid methods were effective in enhancing their own learning. As the courses in the previous study were child development courses, the authors believed that it was important to verify that the CLAD and the hybrid formats would lead to the same outcomes in a different course. Study 2 will examine the CLAD and CLAD-hybrid formats in two adult development courses taught in two separate academic terms.

Method

Participants

Study 2 participants were students enrolled in Adult Development courses in the spring and summer quarters of the 2006-2007 academic year. The first sample consisted of 11 students (mean age = 24) enrolled in a CLAD Adult Development course. All participants were White and most participants were female (73%). The second sample was comprised of 17 students (mean age = 29) enrolled in a CLAD Hybrid Adult Development course. Again, all participants were White and the majority were female (89%).

Procedure

Participants were enrolled in one of two Adult Development courses taught by the first author during the spring and summer quarters of the 2006-2007 academic year. The courses differed only in terms of their pedagogy (method of delivery). The CLAD procedure described in Study 1 was used in the spring quarter Adult Development course. Students used anticipation guides and were evaluated with individual and group quizzes. The summer quarter Adult Development course also used the CLAD pedagogy but with a web-based component. As described in Study 1, students obtained their anticipation guides online through Blackboard. Individual quizzes were taken online, and students had online critical thinking assignments to complete. Students in both courses were evaluated with the same number and type of

assignments as both courses were taught using the CLAD method. Student achievement was assessed through course grades. Surveys were administered to ascertain students' perceptions of the effectiveness of collaborative learning and hybrid teaching methods. Students were also surveyed regarding their attitudes towards collaborative learning at the beginning and end of the CLAD-hybrid course in order to see if their experiences with CLAD had changed their perceptions of collaborative learning.

Results

Because unequal group sizes often affect the t-test assumption of homogeneity of variances, Levene's test for equality of variances was computed. The test was not significant at the .05 level indicating that the homogeneity of variance assumption had not been violated. A comparison of the courses revealed that the CLAD-Hybrid students performed significantly higher than those in the CLAD course ($M = 97.4, SD = 2.85$ versus $M = 93.9, SD = 5.22; t(27) = 2.33, p = .03, d = .832$). It would appear that the addition of a hybrid format increases the effectiveness of the collaborative classroom. Students in both courses rated collaborative methods as either effective or very effective (See Table 3). Likewise, most students in the CLAD Hybrid classroom felt the use of online quizzes was effective in terms of their learning (82.3%).

Table 3
Participants Ratings of Effectiveness of Collaborative Methods

Pedagogy	Collaborative Method		
	Anticipation Guides	Individual Quizzes	Group Quizzes
Adult CLAD	100%	91%	90.9%
Adult CLAD Hybrid	94.1%	94.1%	88.2%

Note. Participants ratings of effectiveness are depicted here as the percentage of participants rating the collaborative method as either effective or very effective.

In the CLAD-Hybrid course, students reported more positive attitudes toward collaborative learning at the end of the course (see Table 4). Specifically, at the end of the course students believed collaborative methods improved their grades and their attitudes towards the course.

Discussion

Study 2 investigated student academic performance in CLAD and combination CLAD Hybrid courses. The authors wanted to explore whether CLAD and combined CLAD - Hybrid formats would enhance student achievement in Adult Development courses as they had in the Child Development courses in Study 1. Of course, the Adult Development courses in Study 2 differed in terms of course content from the Child Development courses Study 1. However, students were required to complete the same number and type of as-

Table 4
Average Difference Scores Showing the Effects of CLAD on Attitudes toward Collaborative Learning

Classroom Experience Survey Items	M	SD	T
My grades improve when I participate in cooperative group work in class.	0.65	1.10	3.44*
Collaborative learning leads to decreased class productivity because group members socialize more and do not stay on task.	0.67	1.34	2.86
Self-esteem of struggling students suffers in collaborative learning activities.	0.59	1.26	2.73
I have a more positive attitude about a class when I work in cooperative learning groups.	0.56	0.82	3.96*
Collaborative learning results in more advanced students being "held back" by the presence of slower learners in a given group.	0.47	1.16	2.37
Group work causes students to be less dependent on the teacher.	0.21	1.30	-0.93
Collaborative learning improves peer relations among students of different ability levels.	0.06	0.98	0.35
I am more likely to consider conflicting or alternative points of view during collaborative work.	0.50	1.05	2.77
Collaborative learning does not allow me to think as deeply as I might on my own.	0.32	0.91	2.07

Note: $N = 31-34$. Means represent the difference between the post score and the pre score on each item.

* $p < .0033$; p -values were subject to a Bonferroni correction because multiple t -tests were computed.

signments in each course. Student performance measured in terms of course grades appears to be high in both of these formats. However, unlike in Study 1, the combination of the CLAD and Hybrid formats was superior to CLAD alone. It is unclear why the CLAD-Hybrid format was superior to the CLAD format alone in Study 2. Future research will need to address this issue.

Study 3: Child and Adolescence

Studies 1 and 2 were based on a series of courses taught by one instructor. Study 3 was conducted to determine if the effectiveness of CLAD would remain if used by a different instructor teaching a third course in a block format. It is based on the results of three Child and Adolescence courses taught by the second author over three consecutive summer sessions. One was a traditional course emphasizing class discussion led by the instructor, the second was a hybrid format, where the in-class portion was discussion based, and the on-line portion centered on interaction through the discussion board of Blackboard. The hybrid-CLAD course combined the essential elements of CLAD as discussed above into the hybrid format.

Study 3 differed from Study 1 and Study 2 in the following important ways. First, each class was taught in a 4-hour block twice a week. This provided an opportunity to extend the CLAD procedure to a less typical course format. To accommodate this course format, several steps of the CLAD process were combined into a single course session. Second, given the positive outcomes associated with CLAD in Study 1 and Study 2, we wanted to examine whether incorporating as many elements of the CLAD process itself into the on-line portions of the course would lead to favorable outcomes. We wondered whether it was possible for students to become engaged in group work, and reach consensus when not meeting face to face. Third, none of the participants had any prior exposure to CLAD. Thus student reactions would be based on this class alone, and prior expectations could not affect the results.

Method

Participants

Study 3 participants were students enrolled in Child and Adolescence courses during three consecutive summer sessions. The first sample consisted of 17 students enrolled in a traditional Child and Adolescence course. Fifteen of the participants were female, 15 were White, and 2 were African American. One participant was unable to complete one of the exams and was dropped from further analyses. The second sample was comprised of 21 students enrolled in a CLAD Hybrid Child and Adolescence course. Sixteen of the participants were female, 17 were White, 3 were African American, and 1 was of Hispanic decent. One student stopped coming to class, and one failed to complete the CLAD portion of the course. Both were dropped from subsequent analysis. The third sample was smaller, and consisted of 9 students enrolled in a Hybrid Child and Adolescence course. Seven participants were female, 8 were White, and 1 was African American (see Table 5 for additional demographics).

Table 5
Demographics

Course	N	M	Age		
			SD	Mdn	Range
2006	17	36.71	14.26	27.00	22-64
2007	21	32.29	11.87	27.00	20-59
2008	9	22.67	3.97	21.00	19-32

Procedure

The primary pedagogy in the traditional Psychology of Childhood and Adolescence course was a discussion based format, led by the instructor. Students individually completed 3 exams and a major term-paper.

In the CLAD - hybrid course, the CLAD process followed that discussed in the Study 1 with the following exceptions. First, paralleling the hybrid course, for 33% of the class sessions, students completed all portions of the class

on-line, utilizing Blackboard. Specific to CLAD, students were required to work together through a discussion board to reach a consensus on the AG's, and to complete the group quiz. The quizzes were set up such that the individual quiz had to be completed before the group quiz would become available. Second, instead of completing the individual quiz before having the class reach consensus on the anticipation guide, the steps were reversed. This alteration in the procedure was used as a mechanism to reduce the possibility of students studying and learning material that was incorrect. By reaching consensus with the class prior to taking the individual quiz, students may have been able to correct any misperceptions they had prior to answering quiz questions. Third, because the group quizzes were taken on-line, there was no opportunity for the use of color-change markers, nor the ability to correct an incorrect response for lesser credit. Fourth, during the in-class sessions, steps 4, 5, 6, and 7 (as described in Study 1) were combined, such that in a single class session, students reached a consensus on the questions presented on the anticipation guide, completed an individual quiz, and completed a group quiz which allowed for immediate feedback and correction.

In the hybrid version of the same course, which is based on a traditional course delivered partially on-line (with no CLAD components) students were assigned 2 exams, three quizzes covering the material they were primarily responsible for during the Blackboard sessions and a major term paper. Approximately 33% of the class was entirely on-line, through Blackboard. To maintain the focus on discussion, students in the on-line course were expected to respond to a series of questions posted on Blackboard. In addition, they were required to respond to each other's posting. In total, each student was graded on 30 postings.

Replicating Study 1, students were also surveyed regarding their attitudes towards collaborative learning at the beginning and end of the CLAD-hybrid course in order to see if their experiences with CLAD had changed their perceptions of collaborative learning.

Results

Results were analyzed with two different dependent variables, final grade based on all points and final grade based only on exams and quizzes. Because unequal group sizes and small group sizes can both impact the assumption of equal variances, Levene's test of the homogeneity of variances was conducted. When assessing grade based on all points, groups had equal variances (Levene = 3.137, $p > .05$). An ANOVA of the three courses revealed a significant effect of course type, whether the performance criteria was overall course grade, $F(2, 41) = 4.33, p = .02$, or average grade based solely on tests and quizzes, $F(2, 41) = 5.46, p < .01$. Tukey follow-up tests indicated that students in the CLAD-hybrid course outperformed those in the hybrid course (See Table 6).

However, there was heteroscedasticity in the data when analyzing grade based only on tests and quizzes (Levene = 4.93, $p = .012$). To account for this, Welch's test was used

Table 6
Means and Standard Deviations for Type of Pedagogy and Student Achievement

Pedagogy	N	Overall Grade		Exams and Quizzes	
		M	SD	M	SD
Traditional Child	16	84.03 _{ab}	9.30	79.72 _{ab}	13.30
Child CLAD Hybrid	19	88.53 _b	6.10	86.03 _b	6.55
Child Hybrid	9	80.16 _a	5.89	73.43 _a	7.13

Note. Means with different subscripts differ significantly at $p < .03$ in the Tamhane post-hoc comparison procedure.

in the place of the standard ANOVA. Results indicated a significant effect of course type when grade was based solely on tests and quizzes, $F(2, 20.65) = 10.00, p = .001$. Tamhane post-hoc tests, which do not assume equal variances, indicated that students in the CLAD-hybrid course outperformed those in the hybrid course (See Table 6). Overall course grades in all three courses were derived from differing numbers of assessments. Due to its nature, the CLAD method requires more assessments than a traditional classroom. The purpose of our research is to examine CLAD as an overall process not the various aspects of CLAD. We are not concerned with whether or not the specific assessments enhance learning, but whether CLAD as an overall process is conducive student academic performance.

Examining the change scores for the attitude items listed in Table 4, consistent with Study 1, students reported a significant increase in positive attitude about a class when working in cooperative learning groups. However, there were also significant increases in the belief that collaborative learning leads to decreased productivity because of group socialization and not staying on task, that more advanced students feel “held back” by the presence of slower learners in a group, and that collaborative learning does not allow one to think as deeply as he or she might alone (all p 's $< .0033$ due to Bonferonni correction for multiple t -tests; see Table 4 for details of item wording).

Discussion

Although the small size of the third sample reduces generalizability, the results are promising. As hypothesized and consistent with Study 2, the CLAD process led to enhanced student performance when used in a hybrid course compared to a traditional hybrid class. Although the same portion of the course covering the same material was on-line in the hybrid version of the class, students were not part of an interdependent group. The quality of the posts indicated a lack of connection among students. In the CLAD-hybrid version, the posts tended to take on a dialogue among the students, an aspect that was lacking in the hybrid version of the course.

From the instructors' point of view, students were more engaged in both the traditional course and the CLAD-hybrid course. Further research will be needed to address the similar-

ity in performance when comparing the traditional pedagogy and using CLAD in a hybrid format.

While the attitude items indicated an increase in positive attitude toward the class, perhaps indicating greater enjoyment with the course, students also reported increases in undesirable aspects of collaborative efforts, including less productivity, feeling held back, and less critical thinking. Because the CLAD method appears to improve course performance, and perhaps overall attitude toward the course, future research will have to examine the negative effects of collaborative efforts. For the majority of students this course was their first exposure to extensive collaborative learning. They may have experienced a group project in other courses, but apart from the on-line portion of the course, the entire course was built around the collaborative efforts. As students gain experience in collaborative learning, and begin to assume responsibility for their learning, perhaps the undesirable attitude changes we observed will decrease.

General Discussion

Overall, the results of our investigation support the benefits of the using the CLAD procedure in college level developmental psychology courses, although the hypotheses were not fully supported. The primary study demonstrates that the traditional mode of lecture led to the poorest level of student performance, in partial support of the first hypothesis. The second hypothesis received support from both Studies 2 and 3, where student performance was better in the CLAD-hybrid course compared to the CLAD traditional course. The third hypothesis only received partial support from Study 3, where students in the CLAD-hybrid course outperformed those in the hybrid course, but did not differ significantly from students in the traditional course.

Across these three studies, inconsistencies regarding the effectiveness of each pedagogy are evident. However, in no instance did a traditional format lead to better performance as compared to a course based on CLAD. This suggests the need for further analysis of the CLAD process. As an alternative teaching pedagogy, it does not appear to have any negative impact on student performance as assessed by two instructors comparing nine separate courses. The results support previous research (e.g., Johnson, Johnson, & Smith, 2007) indicating that students enhance learning when working in active groups versus passive learning. The results of prior research by Fitch and Hulgin (2007), who found the CLAD method to be effective in K-12 settings, were also supported.

Holding student performance constant, is there value to collaborative methodologies such as CLAD? On attitude measures, students reported positive attitudes toward the major components of the CLAD procedure, the anticipation guides and the group quizzes. Across 2 studies, students also reported an increase in having a positive attitude toward the class when working in collaborative learning groups.

Future research could also examine what else students might be learning in these collaborative sessions, other than

course content knowledge. In many instances, the students act as a teacher to peers who are having difficulty with a concept. Does this enhance their level of understanding of the material, perhaps in a manner that is not evident in many exams?

Although there were increases in positive attitudes toward collaborative learning, the results also suggest that there may be some risk involved. Some students reported that the collaborative methods utilized in the CLAD procedure led to decreased class productivity, and that more advanced students were being held back in a group setting. However, the negative attitudes toward CLAD may disappear in time. In Study 1 and 2, some of the students had been exposed to CLAD in prior classes, and the reactions toward CLAD were positive. Study 3 differed in that no student had any experience with the CLAD procedure prior to this course. From the subjective view of the instructor, as a whole the class expressed resistance during the initial description of the CLAD process. It is a major shift for students to adapt from viewing education as content that is delivered via an instructor, and being forced to accept primary responsibility for learning material. Perhaps with time the resistance diminishes as students see the effectiveness of this methodology. While increasing negative attitudes toward collaborative learning is a risk, it may be worth taking, given the increase in student learning, and the overall positive attitude toward the CLAD process.

Limitations

There are a number of limitations to this study. The primary limitation is that all courses were taught by two of the authors of this study, both of whom were aware of the research hypotheses. Thus, we could have unintentionally influenced our findings. Although the authors were aware of the purposes of the study, by having one instructor teach all courses within a given study, variables associated with the instructor and his or her personality are held relatively constant. Thus, individual difference variables do not affect the results of the study. We believe this to be more beneficial than having courses taught by different instructors. Realistically it was not possible to remain unaware of the purposes of these studies. One cannot attend a conference on teaching (such as the National Institute on the Teaching of Psychology) and avoid presentations on the effectiveness of collaborative learning, or on the outcomes of on-line learning. Some of the students taking the courses in these studies were education majors, who are also taught the benefits of collaborative learning. The ideal situation of a double-blind study was not possible. However, we felt the importance of determining whether CLAD was an effective means of education in a collegiate setting outweighed this limitation.

Second the number of assignments and quizzes was not held constant within each course within each study. Because research has shown that repeated quizzing can lead to improved test performance (; Dustin, 1971; Gaynor & Millham, 1976; Rohm, Sparzo & Bennett, 1986)), this is an

alternate explanation for some of the results (we would like to thank an anonymous reviewer for identifying this limitation). However, the purpose of this article was to compare the effectiveness of courses taught using CLAD to those taught in a hybrid or a traditional format. The CLAD procedure has many more quizzes built into it compared to a traditional, exam based course. In addition, the reading guides are not a part of either of the other course formats. Our intent was not to determine which aspect of CLAD is effective. We needed to determine if a process that has not been used in college-level psychology courses was sufficiently effective in an overall manner to warrant further research. Given our results, we feel it is, and are planning an additional series of studies to isolate the aspects of CLAD that are most effective.

Third, we were unable to randomly assign students to condition, in part due to the size of the institutions involved. No more than 2 identical courses could be taught in a given semester, and summer sessions were further limited by enrollment. Second, there are technological issues surrounding any on-line classes that cannot always be anticipated. Servers can malfunction, and internet server providers can also fail to function properly. Attempting to have students interact as a group on-line, in a synchronous manner, not simply the asynchronous nature of a typical Blackboard discussion poses additional problems. Because students were using different methods of connecting to the internet from home, including dial-up connections and high speed cable connections, lag times for group responses caused enough trouble for one group that they chose to meet together as a group instead of interacting on-line. In addition, when doing classroom research it is difficult to coordinate equal class sizes, therefore there is variation among groups. Finally, these results can only be generalized to predominately White college settings and follow-up studies are needed to see if similar results are evident with more diverse samples.

In spite of these limitations, our results suggest further research is warranted to better clarify the conditions under which CLAD is most effective. It appears that this collaborative method is superior to traditional instruction methods used in many collegiate courses, and can be applied to both face to face and hybrid classes. Whether the technique could be adapted to a completely on-line or distance format where all of the collaboration would take place in cyber space could also be explored. If further research supports these findings, the implications for education are substantial, and may lead to better teaching methods, and improved student learning.

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