Interpreting collaborative reasoning and instructional strategies in argumentative writing

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	ABSTRACT
Keywords: *Argumentative Writing;* *Collaborative Reasoning;* *Instructional Strategies*	This experimental study combined collaborative reasoning and instructional strategies as an alternative in argumentative writing. This is important to determine the extent to which the combination of these approaches can enhance students' writing skills. Collaborative reasoning is an approach in learning where students collaborate to formulate thoughts or solutions to a problem. Meanwhile, instructional strategies refer to the approaches and methods used by teachers to guide students in understanding and developing argumentative writing skills. The study took place at SMAN 1 Bangkinang Kota, Riau province, Indonesia. There were 100 students from second grade who participated. The results of the study showed that the combination of the socially-oriented approach in the forms of collaborative reasoning and instructional strategies in argumentative writing by the treatment group was more effective than the control group. Innovative teaching strategies are beneficial for both students and teachers. The combination has helped students develop better writing ability.

1. INTRODUCTION

Writing is a time-consuming and difficult process that requires writers to arrange various cognitive tasks associated with writing in order to cope with various limitations (Kieft et al., 2006). It is considered a hard thing to be accomplished and has multivarious task to be completed (Rinda et al.,2022). There are various problems faced in writing including the lack of vocabularies, grammar and, the inappropriate choice of the words (Rohmana & Jianggimahastu, 2019). Besides reading, writing ability is also a predictor of academic achievement and a prerequisite for civic involvement and participation in the global economy. Many teenagers in the United States who are high school graduates did not have adequate basic writing levels as required by universities and employers (Lenhart et al., 2008).

The Dutch Inspectorate of Education found the quality of writing instruction in two-thirds of schools e insufficient (Henkens, 2010 as cited in Rietdijk et al., 2017). There is also a growing trend worldwide for children to begin learning English at an earlier age in school (Graddol, 2006 as cited in Lo & Hyland, 2007). Therefore, children need opportunities to understand and apply purposeful writing (Morrow 2005; Tompkins 2005 as cited in Paquette, 2007). Young students should learn how to introduce a topic, present their perspective, support it with reasoning and facts, and conclude. This type of writing is crucial for academic success and should be taught as early as possible in school (Wolfe, 2011).

Academic achievement requires the ability to think and write in argumentative context (Traga Philippakos & MacArthur, 2020). Unfortunately, young learners often struggle with argumentative writing (Erduran et al. 2015). Argumentation is a type of discourse in which knowledge assertions are created and evaluated based on empirical or theoretical evidence. Argumentative writing should be taught to young students through appropriate strategies, task

structure, and modeling, as it is a relatively new approach (Traga Philippakos & MacArthur, 2020). A significant portion of writing should be argumentative in nature, as logical argumentation is essential for knowledgeable individuals and gains in knowledge are often achieved through debate, particularly when it comes to clarifying and refining viewpoints through rigorous examination Richard Andrews, 2010 as cited in Wolfe, 2011).

This study provided an alternative to the teaching of argumentative writing by combining the collaborative reasoning and instructional strategies. This study examined the feasibility of the learning method, the professional development (PD) model and obtain preliminary evidence of the efficacy.

A variety of approaches have been used to improve young learners' argumentative writing ability (McCarthey & Ro, 2011). Newel et al., (2014) also explored two broad methods to instructional research: a cognitive approach using instructional strategies and a social approach utilizing dialogic interaction.

Instructional strategies is another example of an approach to argumentative writing to improve students' text comprehension (Ka-kan-dee & Kaur, 2015). Moreover Landrieu et al., (2023) found improvement after the results of the approach instructional processes and the effects of instructional strategies were evaluated individually. Some researchers found that instructional strategies affect the students' ability in writing, as it incorporates strategies for revising and planning. General writing tasks, such as argumentative, persuasive, narrative, and general expository texts were preferred nowadays. For instance, Silva (2015) found that writing with instructional strategies is effective in writing in a second language for academic purposes. It is in line with Guzel-Ozmen (2006), strategy instruction is effective in writing with mildly mentally retarded turkish students.

Collaborative reasoning is one example of a dialogic approach to argument (Philippakos, 2022). Reznitskaya et al., (2009) stated that collaborative reasoning is a teaching approach for primary school students that involves them in group conversations regarding difficult subjects highlighted in their readings. The foundations of CR are social learning and schematheoretic perspectives of cognition, which are combined to generate a new model known as argument schema theory (AST). Moreover, Kiesewetter et al. (2017) stated that collaborative reasoning refers to situations in which two or more people purposefully coordinate their thinking in order to achieve justifiable outcomes.

Reasoning is the conscious effort to coordinate inferences to reach justifiable conclusions (Kiesewetter et al., 2017). Collaborative reasoning (CR) is a peer-led, open-format approach to debate that aims to enhance the quality of classroom conversation and promote critical reading and thinking (Zhang & Dougherty Stahl, 2011). In education, reasoning is considered a universal learning mechanism (Nokes, 2009; Richland, Zur, & Holyoak, 2007 as cited in Lin et al., 2012). Reasoning can be viewed as both a cognitive action performed by an individual and a social process, where two or more individuals coordinate their thinking to achieve a shared goal (Kiesewetter et al., 2017).

Dialogic argumentation is a method of teaching argumentative writing with main emphasis on the examination of multiple perspectives (Kuhn et al., 2011). Since argumentation involves considering different viewpoints, it is inherently dialogic. Therefore, participating in debates and dialogic exchanges can help students learn how to construct arguments and respond to opposing viewpoints. National science standards recognize argumentation as a vital component of science education (American Association for the Advancement of Science, 1993; National Research Council, 1996 as cited in Clark & Sampson, 2008).

Dialogic argumentation is a critical component of argumentation theory and is used in many computational domains to handle ambiguous, partial, and conflicting information (Reed, 2006). In education, individual expository writing is the most common situation in which argumentation is taught and evaluated, and it is often regarded as one of the most challenging skills for teachers to teach and for students to master (Ferretti & Lewis, 2013 as cited in Kuhn et al., 2016). Dialogic argumentation refers to the process of individuals or organizations in persuading each other to accept contradictory views (Skoumios, 2009).

This study investigated the effects of an instructional approach to argumentative writing for secondary school students, in which cognitive instructional strategies on writing processes and organization were combined with a dialogic approach, CR to develop students' comprehension on argumentation. Teachers were given a guidebook containing all of the lessons. Teachers were also given posters with the writing approach ladder, sentence frames, and the planning and assessment criteria, as well as the children's books they would use in their lessons.

The teachers were asked to compare their lesson plan to the video of the instruction provided to students. They received coaching video during the instruction process and recorded their own classes, with the researcher providing written feedback on the pace and quality of instruction. Each teacher received comments on four recorded classes from the researcher. The researcher was also available to answer questions or provide clarification via phone and email. As the teachers had previously stated a preference for written feedback over verbal feedback, the feedback was provided in that format. (Traga Philippakos et al., 2018). Based on the background of this study, the following research questions were proposed.

1. Is there any influence between treatment and control on students' writing skills?
2. How is the effect of pre-test and post-test treatment on students' writing measures and writing quality?

2. METHOD

The main method of analysis was the difference or comparison test, which was used to compare the average and ranking of students in the treatment and control groups. This analysis was conducted using the Multivariate Analysis of Covariance (MANCOVA) method. Additionally, a descriptive analysis in the form of a Crosstab was also conducted to provide a detailed description of the values for each group.

The study took place at SMAN 1 Bangkinang Kota, Riau province, Indonesia. Participants were 100 students from second grade. Students (with the exception of eight special education students) were randomly assigned by gender and ethnicity to two groups: treatment group (n ¼ 36) and control group (n ¼ 36). Then the eight special education students were evenly randomly assigned to the two groups after receiving the research permit and students' consent. Before this study was conducted, interviews had been carried out with instructors revealing the need for professional writing development. Teachers emphasized that there was no official Language Arts curriculum in place. The Units of Study served as a guidance for teachers and writing had been focusing on narrative, persuasive, argumentative and informational writing throughout the academic year.

The writing quality was assessed using a 6-point holistic criteria that looked at concepts, organization, and word choice (Traga Philippakos et al., 2018). Conventional mistakes were disregarded unless they impeded the understanding. All articles were scored by two independent raters with strong interrater reliability (r 14.93). Strong correlations are shown by values greater than 80 (Brown, Glasswell, & Harland, 2004).

Addressing the diverse quality, we conducted a second investigation on element inclusion.(Qin & Karabacak, 2010) stated that the elements of argumentative writing include explicit warrants, counterarguments, rebuttals, and qualifiers. Futhermore, argumentative writing ability increased dramatically with grade levels. It should be emphasized, however, that neither study explained how the Toulmin components were found in the publications.

Alternate variants of the TOWL-4 (Hammill & Larsen, 2009) include the subtests of story production, contextual norms, and sentence combining that were performed during the pretest and posttest (interrater reliabilities of 77 percent , 86 percent , and 93 percent , respectively).

Students completed a questionnaire for the the pretest and posttest to assess their SE in terms of developing ideas, writing processes, and particular persuasive assignments (e.g., writing their opinion clearly). The items were particular to the persuasive genre based on earlier surveys on students' writing motivation (Bruning, Dempsey, Kauffman, McKim, & Zumbrunn, 2013; MacArthur & Philippakos, 2010). All 30 items were measured, ranging from 0 (not at all confident) to 100 (extremely confident), as per suggested procedure (Pajares & Valiante, 2006). (very confident). The survey items were read to students as they replied after the trial items were completed.

After post-test, students were interviewed to assess their comprehension of the genre and the procedures they used in the planning and revising stages. They were also asked to describe any difficulties they had encountered, as well as if they had used what they had learnt in class. Twelve students were selected (6 per condition) based on their Dibels Oral Reading Fluency (DORF).

Classroom observations were performed in this study. Every instructor was observed at least three times. Control instructors were observed in order to examine their lesson and to seek for any similarities with the treatment instruction. Treatment teachers were observed to see if they were following the protocol correctly. A checklist of tasks was utilized to ensure the fidelity (e.g., modeling)

A pretest–posttest randomized control group design was employed in this investigation (Field, 2009). The assessments, coaching, and education took 16 days. The study team was in charge of administering the pretest and posttest topics. Directions were prepared, and the administration was audiotaped and transcribed to assure authenticity. In their homerooms, participants wrote two argumentative papers (days 1 and 2). On the third day, students completed the questionnaire. All of the teachers were interviewed and given an online survey to complete. The researcher had met the two treatment instructors for a one-day workshop before to the commencement of the instructional days and after the pretest assessments were completed.

3. RESULTS AND DISCUSSION
3.1. Descriptive statistics

Descriptive statistics was calculated, including the mean and standard deviation of variables defined in several prompt treatments. The results can be seen in the following table;

Table 1. Variable Crosstab

Esssay	Treatment		Control	
	Unadjusted M (SD)	Adjusted M	Unadjusted M (SD)	Adjusted M
PreTest 1	3.77 (1.02)		2.47 (1.19)	
PreTest 2	3.75 (1.03)		2.61 (1.19)	
PostTest 1	3.54* (1.21)	4.98 (1.11)	2.56* (1.20)	3.42 (1.23)
PostTest 2	3.55* (1.08)	4.39 (1.28)	2.28* (1.04)	2.97 (1.24)

The results of the study indicate that the treatment had a significant impact on the average essay scores of the students. At the time of pre-test 1, the students in the treatment group had an average essay score of 3.77 with a standard deviation of 1.02. At pre-test 2, their average score dropped slightly to 3.75 with a standard deviation of 1.03. After the treatment, the average essay score in post-test 1 was 3.54 with a standard deviation of 1.21 and in post-test 2, it was 3.55 with a standard deviation of 1.08. ANOVA test revealed the change in average values between pre-test and post-test in both pre-test 1 and pre-test 2 that were significant, indicating that the treatment had an impact on the students' essay scores.

The results of the study indicate that the treatment also had a significant impact on the average essay scores of the students in the control group. At the time of pre-test 1, the students in the control group had an average essay score of 2.47 with a standard deviation of 1.19. At pre-test 2, their average score increased slightly to 2.61 with a standard deviation of 1.19. After the treatment, the average essay score in post-test 1 was 2.56 with a standard deviation of 1.20 and in post-test 2, it was 2.28 with a standard deviation of 1.04. When analyzed using ANOVA, the change in average values between pre-test and post-test in both pre-test 1 and pre-test 2 was found to be significant, indicating that the treatment had an impact on the students' essay scores in the control group as well.

Furthermore, if the post-test treatment was repeated, there was a significant increase in the average value (Adjusted M) in both the treatment and control groups. In the treatment group, the value of Adjusted M in post-test 1 reached an average of 4.98 with a standard deviation of 1.11, while in post-test 2 it reached an average of 4.39 with a standard deviation of 1.28. In the Control group, the value of Adjusted M in post-test 1 reached an average of 3.42 with a standard deviation of 1.23, while in post-test 2 it reached an average of 2.97 with a standard deviation of 1.24.

Table 2. Element of Opinion for Treatment and Control

Items	Posttest 1		Posttest 2	
	Control	Treatment	Control	Treatment
Beginning				
Overall Beginning	6.07 (1.53) [a]	9.41 (1.24) [a]	8.35 (1.96) [ab]	12.96 (1.65) [ab]
Claim	2.66 (1.26) [a]	4.08 (1.12) [a]	4.94 (1.55) [ab]	7.62 (1.64) [ab]
Reason	1.29 (0.21) [a]	3.37 (1.39) [a]	3.49 (1.06) [ab]	4.84 (1.09) [ab]
Evidence	2.21 (0.96) [a]	4.05 (0.81) [a]	4.49 (1.63) [ab]	7.6 (1.26) [ab]
Middle				
Overall Middle	4.45 (1.47) [a]	7.46 (1.61)	6.73 (1.88) [ab]	11.01 (2.13) [ab]

Items	Posttest 1		Posttest 2	
	Control	**Treatment**	**Control**	**Treatment**
Warrant	2.31 (0.95) [a]	3.96 (1.00)	4.59 (1.43) [ab]	7.51 (1.59) [ab]
Response	2.15 (1.35) [a]	3.5 (1.39)	4.43 (1.77) [ab]	7.05 (1.87) [ab]
End				
Overall End	2.65 (1.14) [a]	3.91 (1.15)	4.93 (1.44) [ab]	7.46 (1.68) [ab]
restatement	0.18 (0.14) [a]	0.25 (0.23)	2.46 (1.03) [ab]	3.79 (1.12) [ab]
Think_more	2.47 (1.14) [a]	3.67 (1.14)	4.75 (1.46) [ab]	7.22 (1.67) [ab]

MANCOVA test was performed to test the effect of treatment and control on students. This test was carried out in 3 sessions, namely the Beginning session with the Claim, Reason, and Evidence indicators, then the Middle session with the Warrant and Response indicators, then the End session with the Restatement and think more indicators.

In the beginning session in post-test 1, the overall difference in the mean value was 3.34 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. The claim indicator had a mean difference of 1.42 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. The Reason indicator had a mean difference of 2.06 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. The Evidence indicator had a mean difference of 1.84 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. Then in post-test 2, the overall difference in the mean value was 4.61 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. The Claim indicator had a mean difference of 2.68 and statistically, the Bonferreni test (Sig: 0.05) significantly different value. The Reason indicator had a mean difference of 1.35 and statistically, the Bonferreni test (Sig: 0.05) showed that the mean value between control and treatment was significantly different. The Evidence indicator had a mean difference of 3.11 and the value of Bonferreni test (Sig: 0.05) shows significant difference.

In the middle session, the post-test 1 results indicate a significant difference in mean value between the control and treatment groups, with an overall difference of 3.01. This is supported by the results of the Bonferroni test, with a significance level of 0.05. The Warrant and Response indicators also show significant differences in mean value, with mean differences of 1.65 and 1.35 respectively. Similarly, post-test 2 results show a significant difference in mean value between the control and treatment groups, with an overall difference of 4.28. This is supported by the results of the Bonferroni test, with a significance level of 0.05. The Warrant and Response indicators also show significant differences in mean value, with mean differences of 2.92 and 2.62 respectively.

In the end session, post-test 1 results indicate a significant difference in mean value between the control and treatment groups, with an overall difference of 1.26. This is supported by the results of the Bonferroni test, with a significance level of 0.05. The Restatement and Think More indicators also show significant differences in mean value, with mean differences of 0.07 and 1.20 respectively. Similarly, post-test 2 results in the end session show a significant difference in mean value between the control and treatment groups, with an overall difference of 2.53. This is supported by the results of the Bonferroni test, with a significance level of 0.05.

The Restatement and Think More indicators also show significant differences in mean value, with mean differences of 1.33 and 2.47 respectively.

Table 3. Pre Test and Post Test on test of Written Language

Items	Treatment	Control
TOWL 4-Pre Test Sentence	5.57 (1.03)ab	4.87 (0.87)ab
TOWL 4-Pre Test Contextual	6.82 (1.42)ab	5.96 (1.02)ab
TOWL 4-Pre Test Story	4.01 (1.04)ab	3.05 (0.89)ab
TOWL 4-Post Test Sentence	6.53 (1.02)ab	5.80 (0.82)ab
TOWL 4-Post Test Contextual	5.86 (0.99)ab	4.96 (0.90)ab
TOWL 4-Post Test Story	3.16 (0.16)	3.13 (0.16)

The results of the MANCOVA test indicate that there is an effect of treatment and control on the Written Language variable as measured through the Sentence, Contextual, and Story indicators. In the pre-test, the difference in average values between the treatment and control groups for the Sentence indicator was 0.70 points and regarded statistically significant in the Tukey's test with a significance level of 0.05. Similarly, the Contextual indicator showed a difference in average values of 0.86 between the treatment and control groups, which was also found to be statistically significant in Tukey's test with a significance level of 0.05. The Story indicator also showed a statistically significant difference in average values of 0.96 between the treatment and control groups with significance level set at 0.05.

In the post-test treatment, the difference in average values between the treatment and control groups for the Sentence indicator was 0.20 points, and this difference was found to be statistically significant using the Tukey's test with a significance level of 0.05. The difference in average values of 0.09 between the treatment and control groups was found statistically significant in Tukey's test with a significance level of 0.05. However, the Story indicator showed a difference in average values of 0.03 between the treatment and control groups, and this difference was not found to be statistically significant using the Tukey's test with a significance level of 0.05.

Overall, the treatment and control groups differed greatly in the written language scores at the pre-test. However, the gap in the post-test was not significant.

3.2. Discussion

This study examined the effects of combining collaborative reasoning and instructional strategies in argumentative writing. The results showed that students in the treatment group produced better quality writing in the posttest. Despite the fact that both groups have included arguments and proof, the treatment group provided more elements for conclusions and reader messages.

Collaborative reasoning (CR) is an educational approach that places dialogic inquiry at the center of its pedagogy. It has been found to promote the development of individual argumentation (Reznitskaya et al., 2009). Additionally, similar results were also found by Domberg et al. (2021) collaborative reasoning has been shown to facilitate young children's reasoning in collaborative problem-solving tasks. Traga Philippakos and MacArthur, (2020)

integrating collaborative reasoning and strategy instruction has been found to improve second graders' opinion writing.

Collaborative writing activities have been found to enhance argumentative writing quality, as they encourage pooling of knowledge, brainstorming, discussing, and problem-solving when writing collaboratively (Moonma & Kaweera, 2021)

Writing with instructional strategies affected the academic writing in the context of second language (Silva, 2015). The results of this study prove that the treatment performed in this study has successfully improved the argumentative writing skills as shown by significant increases. The use of innovative strategies in teaching is very helpful for teachers and students in learning.

This study indicates that the integration of collaborative reasoning and instructional strategies in argumentative writing has a positive impact on the quality of students' writing. This is evident not only from the post-test results, which show a significant improvement in students' writing abilities in the treatment group but also from additional elements such as conclusions and reader messages that were more prominently presented by this group. The findings of this research can significantly contribute to understanding the effectiveness of innovative instructional strategies in enhancing students' argumentative writing skills. The success of the treatment in improving writing skills can also serve as a foundation for the development of further teaching methods applicable in diverse educational contexts.

In the context of second language learning, the discovery that writing with instructional strategies influences academic writing holds significant implications. This can lay the groundwork for the development of more suitable instructional strategies for second language teaching and learning, providing additional evidence of the relevance of instructional strategies in foreign language education. In a broader perspective, this research demonstrates that the implementation of innovative instructional strategies can yield tangible benefits for the development of students' argumentative writing skills. Therefore, supporting the adoption of creative and effective instructional strategies in the educational environment can enhance overall student learning outcomes.

4. CONCLUSION

The current study found that the use of a socially oriented approach, combining collaborative reasoning and instructional strategies in writing argumentation, was more effective than a control group that spent an equivalent amount of time on learning to write opinion essays. The results suggest that implementing innovative strategies can help students improve their writing skills and have a positive impact on the quality of their writing. The students also become more creative in developing their written arguments.

This study suffered from several limitations that must be considered. In this study, small sample size was used and this study was conducted in short period of time which could affect the generalizability of the findings. Additionally, the researcher only used one type of writing activity which limited the generalizability of the findings to other types of writing. Therefore, future researchers are encouraged to assess the impact of such instruction over a longer period of time to see if the effects are sustained and whether it can be applied to other types of writing and reading activities. Furthermore, it would be beneficial to conduct research with a larger sample size.

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